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Queensland, Australia. Geological Survey.

Publication.

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QUEENSLAND.

# BOWEN RIVER COALFIELDS.

(PRELIMINARY REPORT RELATING TO)

Presented to both Houses of Parliament by Command.

Camp, Bowen River, near Havilah,  
18th July, 1878.

SIR,

I beg to enclose herewith Preliminary Report, No. II., "On the Bowen River Coalfields."

I have, &c.,

ROBERT L. JACK.

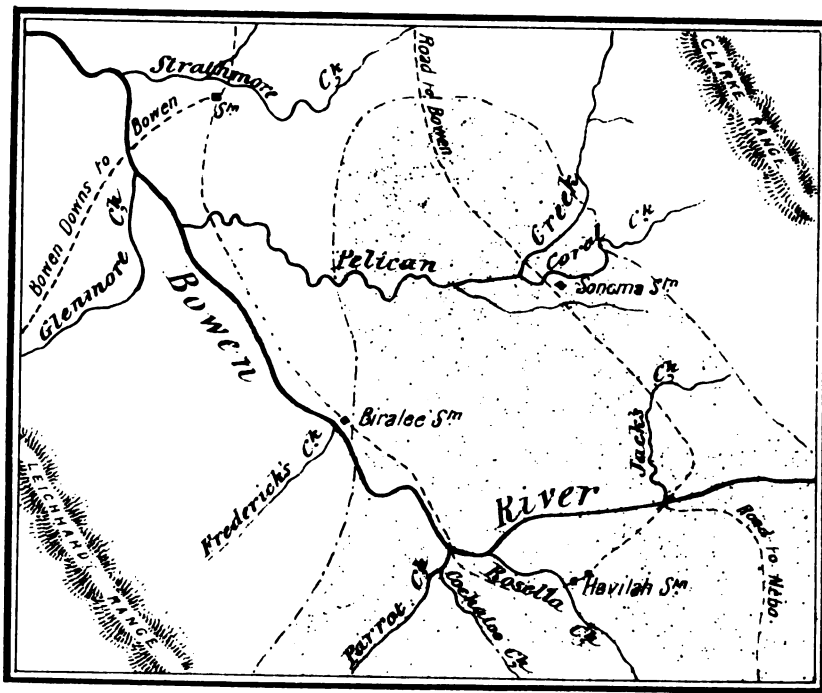
The Honourable the Minister for Mines, Brisbane.

## GEOLOGICAL SURVEY OF NORTHERN QUEENSLAND.

### PRELIMINARY REPORTS.

No. II.

ON THE BOWEN RIVER COALFIELD.



SKETCH MAP OF THE DISTRICT.  
(Scale 8 miles to the inch.)  
COAL AREA SHADED.

As

As the "Bowen River Coalfield," in all probability, extends, with slight interruptions, through six degrees of latitude, from the Bowen River to the heads of the Dawson, it has only been possible yet to examine its northern extremity.

After defining the boundaries of the field, I have hitherto carried out the plan of examining minutely every creek and natural section. By this means I have not only gained an idea of the geological structure of a portion of the field, which may in future be usefully applied to the whole, but have been able to record the position of the outcrop of every coal-seam exposed to view.

Without entering into details, which had better be reserved for a fuller report after investigation shall have been completed, I may say that I have observed, within the area indicated by shading on the above sketch-map, a good many seams of coal, several of them over ten feet in thickness as well as oil-shale, ironstone, and alum-shale.

The strata have not been much disturbed from their original horizontality, having been tilted only into gentle undulations. They are "troubled" by very few "faults."

In chronological order, the deposits of the district are as follows:—

- 1st. Granite and other metamorphic rocks.
- 2nd. A considerable thickness of sandstone has been laid down on the granite, &c.
- 3rd. Volcanoes have broken out and have covered the sandstones with vast sheets of dolerite and porphyritic lavas and ashes. The outcrop of these lava and ash beds forms a part of the Clarke and Leichhardt Ranges, and partly surrounds the coalfield.
- 4th. The sandstones, shales, and coal-seams have been gradually accumulated above the surface of lava and ashes.
- 5th. The volcanic activity was again renewed, and sheets of molten lava forced their way to the surface through lines of weakness in the stratified deposits. The coal-seams unhappily such "lines of weakness," were in many cases utterly destroyed.

The dolerite, which was the agent of this destruction of the coal-seams, has assumed, as it usually does on coming in contact with carbonaceous strata, the form known to miners as "white trap."

Although, so far as I have yet seen, what would otherwise have been the most valuable sections of the field have been more or less damaged by the intrusion of the igneous rocks above referred to, in the highest degree likely that extensive and valuable deposits still remain uninjured. I have already discovered some seams which have escaped, and all my experience in the "burnt" districts of the Scottish fields leads me to believe that the "burning" of the seams must be only partial, and confined to local areas.

I propose to spend ten days or a fortnight more in examining Jack's Creek, part of Rosella Creek, and a part of the Bowen River, east of the limits of the sketch-map. I shall then be in a position where capital may be most advantageously expended in "proving" the field, by boring or otherwise.

As there is some reason to believe that an outlying portion of the coalfield may be found beyond the Clarke Range and Bowen, I propose to return to the coast by the Don Valley, and to examine the district by the way.

In the belt of dolerites and porphyrites surrounding the coalfield, as above described, there are to be considerable deposits of copper ore. cursory traverses of this region (especially near the mouth of Pelican Creek and the Bowen River, up to Biralee) have furnished me with numerous specimens of the green carbonate, associated with zeolites, but have not revealed the existence of the ore in lodes.

Galena is said to occur in large quantities on Flagstone Creek (east of the area embraced by the sketch-map). I hope to visit this creek before returning to the coast.

I see no reason to doubt that this coalfield will one day rank high among the mineral riches of the colony, but that day may be long delayed by the expense of carriage to the coast. If there were no engineering difficulty in bringing the Bowen and Bowen Downs railway through the gap at the mouth of Pelican Creek, the minerals of the Bowen River district will certainly become available.

I have made collections of mineral and fossil specimens.

ROBERT L. JAMES

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1882.

## QUEENSLAND.

### REPORT ON THE LITTLE RIVER COALFIELD, NEAR COOKTOWN, BY ROBERT L. JACK, GOVERNMENT GEOLOGIST.

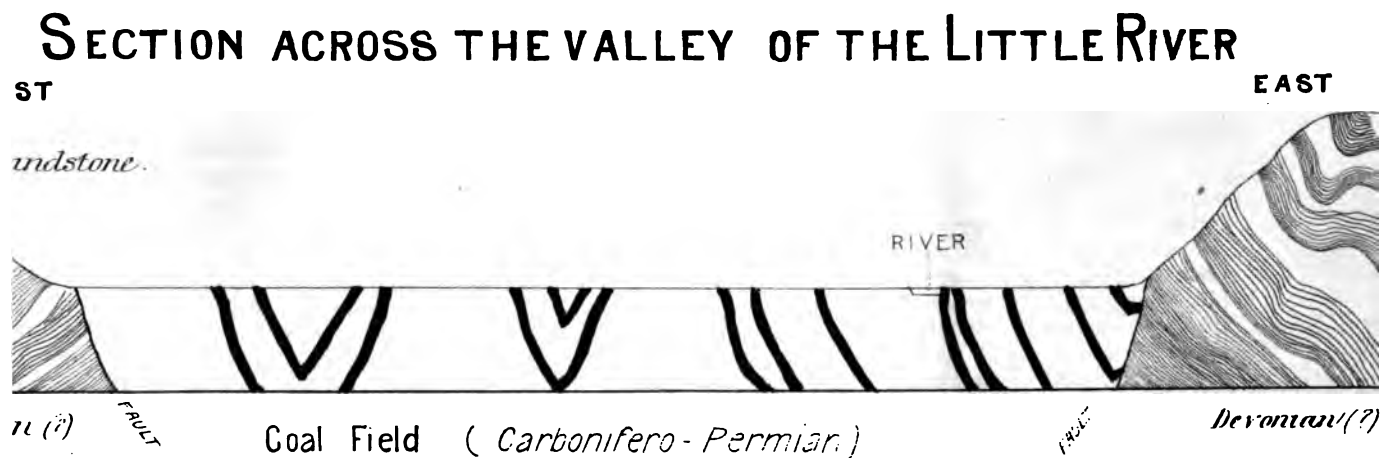
Presented to both Houses of Parliament by Command.

The existence of coal in the neighbourhood of the Palmer has been known since 1872, when Mr. Norman Taylor, the geologist who accompanied Mr. Hann's exploring expedition, discovered *Glossopteris* and fragments of coal, but it was not till the latter end of 1881 that a prospecting party from Cooktown reaped practical benefit from this discovery.

The coal measures extend from a point on the Cooktown and Palmerville road, about 19 miles from Palmerville, for six or seven miles northward down the valley of the Little River.

The Little River is one of the heads of the Kennedy. It takes its rise a few miles to the north of Palmerville, and, after absorbing a large tributary called the Nineteen-mile Creek, keeps a general course a little to the west of north till it falls, about six miles from its junction with the Nineteen-mile Creek, into the St. George River, a fairly-sized stream coming out of the mountains to the east. The St. George, after receiving the Little River, flows for a short distance to the south-west and west till it clears a gap in a sandstone table-land and escapes to the north, to join the Kennedy in about six miles more, near the bend where the latter river approaches the Palmerville road.

The map accompanying this Report shows the extent of the coalfield in the Little River Valley. The following section is explanatory of the structure of the field:—



The oldest rocks in the district are greywackes and slates (probably homotaxial with the European devonian rocks), partially metamorphosed into porphyries, quartzites, &c., and abundantly auriferous in the immediate neighbourhood. It may be mentioned in this connection that colours of gold can be obtained on the coal measures "bottom" in the Little River.

Upon the edges of the devonian (?) rocks, after the latter had been crumpled, upturned, and denuded, the sediments of clay, mud, and sand composing the main body of the coal measures were deposited in horizontal layers, interbedded with seams of coal, each marking a period of terrestrial conditions, with a copious vegetation.

The next event in the geology of the district under consideration was the occurrence of two long parallel dislocations, running nearly north and south along what is now the Little River Valley. The eastern dislocation (or fault) had a "downthrow" to the west, and the western a downthrow to the east. The exact amount of the "throw" in either case I am unable to estimate. The effect of the two faults was to let down a portion of the coal measures (still horizontal) to the level of the greywackes and slates.

Subsequently, owing to the gradual cooling of the earth's interior, its crust underwent further shrinkage, in the course of which the coal measures, wedged in between two masses of slates and greywackes, were crushed together by a powerful lateral thrust, the various strata of the formation being thrown into sharp folds. In the course of long ages of denudation the folds into which the coal measures had

had been thrown had their tops shorn off, so that they now present to our view only a series of strata set on edge, with a general north-and-south strike—at right angles to the direction of the lateral thrust. At the same time the portions of the carboniferous strata outside the two faults were removed from the tops of the devonian rocks.

The coalfield as it now remains, composed as it is of comparatively soft material, owes its preservation to the protection afforded to it by the hard devonian (?) rocks in the midst of which the two faults happily sheltered it.

After the denudation of the coal measures (outside the faults) from the top of the devonian (?) slate and greywacke rocks, a great thickness of coarse sediment was deposited horizontally on them and on the tops of the upturned strata of the coal measures. The right wall of the valley, whether from unequal elevation or unequal denudation, must at this time have risen higher than the left, so that while the left wall was covered by the new sedimentary deposit the right formed part of the shore of the sea or lake in which it was laid down. This formation consists of conglomerate and coarse gritty sandstones. Its age is, I believe, something approaching cretaceous, although direct evidence on this point is singularly scanty. Daintree named it the "desert sandstone," and referred it to a tertiary age.

Since the elevation of the desert sandstone the Little River has removed the formation entirely from the right side of the valley and from the top of the coal measures; but the desert sandstones and conglomerates present steep escarpments on the left wall of the valley, and extend unbroken for many miles to the west.

In the bed of the Little River, 770 yards above its junction with the Nineteen-mile Creek, hard blue greywackes and slates of devonian or possibly silurian age make their appearance. They continue, I believe, to the head of the river. One hundred and forty yards lower they are seen to be replaced by carboniferous rocks—viz., thin-bedded bluish sandstones and shales—dipping to the east at 80 degrees. The shales and sandstones are both hardened. Indeed, at this (south) end of the coalfield both have evidently been subjected to considerable heat, the shales having been porcelained, and the sandstones not quite vitrified, but, as it were, baked. This is the general character of the shales and sandstones for a mile or two down the river.

At a point 560 yards above the junction of the Little River and the Nineteen-mile Creek, on the left bank of the former, is seen the outcrop of a seam of coal 18 feet thick, resting on a thick bed of fine-grained sandstone, not much altered. The coal is smutty and impure. Two thinner seams of coal of similar character occur about 80 yards further down the river.

A gully falling into the right bank of the river 400 yards below the mouth of the Nineteen-Mile Creek exposes another coal smut. On following the gully up, however, the coal measures are found to come to an end in that direction within a quarter of a mile, and to be replaced by the older slates and greywackes, from which they are probably divided by the same fault which divides the two formations further up the river.

For the next 300 yards down the river sections of the coal measures are seen at intervals. Two smutty outcrops of coal seams are among the strata exposed to observation. One is six feet thick, and the other three feet or more. These, with the accompanying sandstones and shales (both of which are a little hardened), dip to the east at angles varying from 35 to 70 degrees.

The next reach of the river, about a quarter of a mile in length, makes no section. At the end of this reach Spring Creek falls into the right bank. This creek, like most of the creeks and gullies on the right bank of the river, traversing or rising in the coal measures, brings down a good deal of calcareous matter in solution, to be deposited as a spongy sinter. Spring Creek shows greywackes and shales within 300 yards of its mouth, thus defining accurately the limits of the coal formation in that locality.

From Spring Creek to Bowerbird Gully (N. 30 degrees W.), a distance of 200 yards, an almost continuous section of dark shales and gritty sandstone is exposed on the right bank of the river. They strike to N.N.E. and are almost vertical. A seam of coal, 8 feet thick at least, is seen on the river bank near the gully. A seam whose outcrop is cut through by the gully is probably the same. A shaft has been sunk on it to the depth of about 15 feet. At that depth the coal is improving. It is still, however, not by any means a clean coal. It contains a large proportion of clay, and has evidently lost nearly the whole of its volatile matter. It is soft and friable, and has a foliated structure. It bears, in short, the appearance of a coal which has from the first had a large admixture of clay, which has been subjected to a crush sufficient to rearrange its particles, and which has been heated enough to produce the volatilization of the greater part of its hydrocarbons. An analysis of a sample of this coal from a depth of 14 feet, by Mr. Karl Staiger, F.L.S., gave the following result:—Moisture, with a very small quantity of gas, 18·32, carbon 65·94, ash 15·74 = 100·00.

From Bowerbird Gully to Dave Creek (200 yards), a section is seen of blue shales and hard sandstones with thin lenticular coal smuts. They strike north and south and are nearly vertical, though sometimes they dip slightly to the east.

About 130 yards up Dave Creek a very large coal smut is seen on the left bank. A shaft has been sunk on it to the depth of 22 feet. The coal seam is at least 8 feet thick. It is very similar in quality to the last described (in the river). The last 5 or 6 feet were sunk during my stay on the field. Even in that distance the coal was distinctly improving in quality. Fragments of comparatively good coal could be picked out of the friable mass. Of specimens obtained here, I have since my return made the following approximate analysis:—

Water	...	...	...	...	...	...	...	...	0·919
Volatile hydrocarbons	...	...	...	...	...	...	...	...	9·388
Fixed carbon	...	...	...	...	...	...	...	...	58·606
Ash	...	...	...	...	...	...	...	...	31·087
									<hr/>
									100·000

Sp. gr. 1·37.

The

The coal measures extend up Dave Creek (east) for about 350 yards from the shaft, when the slates and greywackes are first met with. On the right bank of the next reach of the river, extending N. 30° W. from the mouth of Dave Creek, a considerable thickness is exposed of sandstones and shales, nearly vertical or dipping at a high angle into the bank. Among the upper beds of the series, between a sandstone bed and some shales, is a 2 ft. seam of coal smut. A second coal smut, about 3 feet thick, is separated from the first by a thickness of about 50 feet of shales. A fault crosses the creek north of the last-mentioned coal seam, and divides it from a rather confused section, in the upper part of which are shales overlying three seams of smutty coal, with shaley partings, amounting in the aggregate to a thickness of about 20 feet.

From this point no coal outcrops are seen for a distance of three-quarters of a mile down the river, although shales and sandstones belonging to the coal measures are exposed at intervals. At the end of the three-quarter mile three outcrops of smutty coal are seen on the right bank of the river, dipping to the east at about 50°, accompanied by bluish shales and grey sandstones. The thickness of the uppermost coal seam is uncertain. The other two are each 3 feet in thickness. A few yards further to the N.E. is a considerable thickness of bluish shales, with a 6-inch band of fine grained ferruginous sandstone, almost a clayband ironstone.

For the next half-mile (mainly north) the right bank of the river shows a nearly continuous section of blue shales and thin-bedded hardened sandstones, but no coal seams. These strata strike a little to the west of north, and are either vertical or dip a little to the east or west; they contain *glossopteris*. The slate and greywacke hills are here within a furlong of the river.

The next 1,300 yards of the river expose no rocks of any kind.

The next sections occur in a horseshoe-bend with its convexity facing east. The strata are sandstones and shales, with a few thin bands of clayband ironstone. In the middle of the northern limb of the horseshoe a smutty coal seam is seen, about 1 foot thick, dipping at a high angle to the west.

The outcrop of an 18 inch seam of smutty coal is seen on the left bank of the river about 400 yards further west. It dips at 80 degrees to the west, and rests on clays and blue shales.

Near this outcrop a creek falls into the river; this creek crosses the Palmerville Road about a mile north of Fairlight; it rises in the desert sandstone ranges, tumbles over the cliffs which form the left wall of the Little River Valley, and exposes the upturned greywacke and shales upon which the desert sandstone rests. After cutting through the metamorphic rocks for a short distance it enters the coal measures country, and to some extent fills up what has been left blank in the section made by the corresponding portion of the river. It shows (below the road) three outcrops of smutty coal, each about 6 inches thick, and a 6 ft. seam with two clay partings. These strata have a N. and S. strike, and are almost vertical.

About half-a-mile down the river (to the N.E.) is seen a considerable thickness of dark shales and ferruginous sandstone, with bands of impure clayband ironstone up to 8 inches thick.

One mile further down the river a continuous section about 100 yards in length occurs on the left bank. The strata dip about 45 degrees N.N.E., and consist of shales, fireclays, and thin-bedded sandstones, with four seams of smutty coal respectively 1 foot 6 inches, 1 foot, 1 foot, and 1 foot thick.

Three hundred yards further down the river a high landslip exposes a rather confused section of shales and sandstones. The former contain *glossopteris*, and the latter the impressions of tree trunks. A marked feature of the sandstone is the intercalation of thin bands of concretionary ironstone, like the roe of a large fish. The strata dip into the bank (i.e., E.N.E.) at 25 degrees; they present an unaltered appearance in strong contrast to the baked condition of the rocks at the south end of the field. Chiefly attracted by this, I cleared away with my hammer a portion of the rubbish, and was rewarded by the discovery of a seam of coal very superior to any hitherto known in the field. A few days later Mr. Hannan, one of the prospectors, opened out the seam with the pick sufficiently to enable me to see its thickness and relations. The following is the section of the cliff:—

	ft.	in.
Coal, good	...	0 7
Dark-grey shales	...	0 6
Coal, good	...	0 7
Dark shales	...	1 0
Decomposed carbonaceous ironstone, like a weathered blackband	...	0 3
Coal, fair	...	0 7
Grey shales	...	0 4
Dark-gnarled shales	...	0 3
Grey shales and sandstones, with a few bands of oolitic ironstone (1-2 inches) and marks of fossil trees, down to the river bank, say	20	0

This coal (taken, it must be remembered, from the very surface) gave the following results, on being subjected to an approximate analysis on my return to Townsville:—

Water	...	2.763
Volatile hydrocarbons	...	26.197
Fixed carbon	...	62.998
Ash	...	8.042
		100.000

Sp. gr. 1.33.

A fault intersects the strata at the north end of the landslip, about 100 yards from the outcrop of the coal seam last referred to. It has a downthrow to the north, and turns up the edges of about five feet of shales and one foot of coal.

From this point northward to the junction of the Saint George and Little Rivers, coal measure strata are occasionally exposed, but no coal beds are seen.

It is unfortunate that the general course of the river coincides with the line of strike of the coal measures. Had this not been the case the river would doubtless have laid bare many more coal seams than it now does.

For

For the sake of comparison with the coals of this district, I append below reportson New South Wales coals by Professor Liversidge :—

Name of Colliery.	Moisture.	Volatile Hydrocarbons.	Fixed Carbon.	Ash.	Sulphur.
Mt. Keira ... ..	1.15	23.51	64.65	9.70	0.99
Berrima ... ..	1.70	32.78	53.84	10.40	1.28
Mt. Kembla ... ..	1.50	19.74	67.18	10.72	0.86
Dymocks, Jambooroo ... ..	1.50	20.22	56.56	20.70	1.02
Russel's ... ..	1.84	44.09	49.95	2.70	1.41
Greta ... ..	2.25	39.21	54.41	2.72	1.41
Waratah ... ..	2.21	36.70	55.82	4.15	1.12
Wallsend ... ..	2.75	34.17	57.22	4.64	1.22
A. A. Co.'s Mine, Newcastle ... ..	2.20	32.60	57.52	5.35	1.33
Anvil Creek ... ..	1.74	41.10	47.90	7.80	1.46
Comp. Little River, Queensland	2.763	26.197	62.998	8.042	...

It appears that the proportion of ash in the Little River coal is higher than that in the Anvil Creek seam, but not so high as in the Mount Keira and Berrima coals.

In volatile hydrocarbons the Little River seam compares unfavourably with the majority of the New South Wales coals. The coal would therefore in its present state be not very suitable for gas-making. It must be remembered, however, that our sample is from the surface, and that at a depth the volatile matter will increase and the ash proportionately diminish.

On the other hand, the Little River seam contains a very high proportion of fixed carbon. It is only excelled in this respect by two of the seams (Mount Keira and Mount Kembla) in Mr. Liversidge's list. As it stands, it will take a high place among coals for steam and smelting purposes, and some improvement may be reckoned on as the seam is worked away from its outcrop.

As regards the coal seams in the southern part of the field, at the present depth of the experimental workings they are useless for gas-producing, and require a good draught to keep them burning, the proportion of ash to fixed carbon being too high. They have evidently been deprived of much volatile matter by heat. They will doubtless improve at a depth *to the extent to which they have been affected by surface weathering.*

I satisfied myself on the ground that the heating to which these coals have been subjected was not due to the intrusion of igneous rocks. The heat was in all probability evolved during the crushing which set the strata on edge.

The occurrence of glossopteris, the characteristic fossil of the New South Wales and Bowen River coalfields, indicates that the Little River coalfield is of palæozoic age. Only a small proportion of the coal seams is exposed by the river and a few gullies, and I have no doubt that many more remain to be discovered.

The presence of ironstones among the coal seams must be kept in view, as this circumstance will probably influence in the most important manner the future prosperity of the field.

The good seam of coal is about 110 miles from Cooktown by the road, but the distance would probably be shortened considerably by a railway.

ROBERT L. JACK.

Townsville, 8th May, 1882.

Price 6d.]

By Authority: JAMES C. BRAL, Government Printer, William street, Brisbane.

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For the sake of comparison with the coals of this district, I append below report on New South Wales coals by Professor Liversidge:—

Name of Colliery.			
Mt. Keira	...	...	...
Berrima	...	...	...
Mt. Kembla	...	...	...
Dymocks, Jambooroo	...	...	...
Bussel's	...	...	...
Greta	...	...	...
Waratah	...	...	...
Wallsend	...	...	...
A. A. Co.'s Mine, Newcastle	...	...	...
Anvil Creek	...	...	...
Comp. Little River, Queensland			

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The occurrence of River coalfields, indicates the coal seams is exposed to be discovered.

The presence of iron probably influence in the

The good seam of probably be shortened coal

Townsville, 8th May, 1881

Price 6d.]

By Author

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QUEENSLAND.  
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# REPORT

ON THE

TIN MINES OF HERBERTON, WESTERN,  
AND THOMPSON'S CREEK DISTRICTS,

AND THE

SILVER MINES OF THE DRY RIVER, QUEENSLAND;

BY

ROBERT L. JACK, GOVERNMENT GEOLOGIST.

WITH TWO MAPS.

---

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY COMMAND.

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BRISBANE:

BY AUTHORITY: JAMES C. BEAL, GOVERNMENT PRINTER, WILLIAM STREET.

—  
1883.

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# REPORT

ON THE

## TIN MINES OF HERBERTON, WESTERN, AND THOMPSON'S CREEK DISTRICTS, AND THE SILVER MINES OF THE DRY RIVER.

Geological Survey Office,  
Townsville, 12th May, 1883.

The following pages contain an account of observations made in the Wild River District in September, October, and November, 1882. The progressive development of the field will appear when a comparison is made between the present aspect of affairs and that described in the report which I made in October, 1880.\* In that report an opinion was expressed that "the one thing wanting" to secure the permanency of the field—then only a few months old—was machinery, without which the extinction of a promising new industry could not be far distant. Machinery is now on the ground, and there is now no need to fear the "extinction" of the industry. Its further progress, however, demands the speedy extension of a railway to the coast, the cheapening of working expenses and carriage, and the admission of capitalists on advantageous terms.

### HERBERTON DISTRICT.†

#### GREAT NORTHERN PROSPECTING CLAIM.

*Herberton Tin Mining Company.*

The most conspicuous visible feature on the surface of the prospecting claim is a wide dyke of compact, highly silicated, yellowish or pinkish felsite or elvan, with bleb of quartz. The elvan sometimes passes into quartzite, and is sometimes veined with quartz. The quartz has in places rather large quantities of arsenical iron pyrites. A cavity in the elvan dyke, in size and shape like the interior of a coffin, has its sides coated with the blue carbonate of copper.

In the south-east corner of the claim is a mass of coarsely crystalline granite, with pink orthoclase crystals, quartz and black mica. This is probably the main mass from which the granite veins proceeded which interrupt the gully lode. On coming in contact with the granite mass the elvan dyke takes a course to the south-east across the so-called No. 3 lode. It is evidently newer than the granite.

Near the south-east corner of the ground the elvan dyke bifurcates. One branch passes by the north end of the old workings of No. 3 lode, and can be traced south-eastward to the eastern boundary of the Erin-go-Bragh claim, and is again met with to the east-south-east in the Irish National Land League. The other, after a short interval, during which it has not come up to the (present) surface level, continues eastward to the prospectors' south-west corner on the crown of the ridge, and traverses, on a course a little to the north of east, the General Grant, Herberton Ironclad, Home Rule, Irish Girl, St. Patrick, Young America, New Zealand West, and Glanmire claims. From this point to the first place where the dyke is seen near the south-west end of the prospecting claim is a distance of about a mile.

Just outside of the south-east corner of the claim a cutting has been made in the dyke, which is here pretty evenly impregnated with the arsenical pyrites.

The "No. 1 lode," the first discovered on the field, still ranks first among the mines in the district. It has a general trend of north 20 degrees east to south 20 degrees west, and is nearly vertical. It is a dyke, probably once of quartzose diorite, but which has undergone much metamorphism. At present it has a dark-green matrix of hornblende, with quartz granules freely mixed with chlorite, and coated with chlorite and fibrous serpentine. The nature of the outcrop will be understood by reference to *Fig. 1*, in which the original appearance of the surface has been reconstructed, with the assistance of Mr. Bonnar, the manager.

South of the principal shaft the dyke terminates, so far as the surface is concerned, against a vertical wall of porphyry running north-east and south-west. This wall stands at present about 10 feet above the level of a floor of puddled clay designed to keep the water of the gully out of the workings. The dyke and ore have been quarried up to this wall.

Below

\* Brisbane: Printed by Authority.  
† See map No. 1.

Below the level of the puddled surface the wall, as well as the dyke and ore, underlie to the south at 45 degrees. This underlie, however, does not continue, as at the 60-foot level the dyke occupies practically the same position. (*See plan of 60-foot level, Fig. 2.*)

On the left the dyke and ore were also bounded at the surface by a vertical wall of porphyry. This wall stands about 8 feet above the surface of the puddle. Along the eastern side of this wall the dyke and ore were quarried from the former surface down to 6 feet below the level of the surface of the puddle. In the angle between the two walls and on the edge of the gully the main shaft, 60 feet in depth, has been sunk. Measured at right angles to the western wall, the stanniferous dyke must have been about 13 feet wide. From the convergence of the two walls to the gully is a distance of about 20 feet. The ore continued all the way, being bounded on the east by another porphyry wall which was distinctly seen in the middle of the shaft and at the crossing of the gully.

North of the gully the ore rapidly narrowed to a thin vein, the dyke being often almost entirely replaced by a quartz reef, till at the distance of 21 feet from the shaft it began again to widen. At this place the wedge-like point of a syenite vein just touches the line of the lode. It is traceable south-westward across the gully, in which direction it widens out. The syenite is mainly a mass of pink orthoclase felspar in large crystals, some large quartz blebs, and a very little hornblende.

At the 28-foot shaft (40 feet north of the main shaft) the dyke has attained a width of over 3 feet, and is still widening, although much mixed with quartz. The ore was poor here at the surface, but at the depth of 6 feet a shoot of rich ore came in.

Two chains south of the 60-foot shaft an elvan dyke is seen traversing the porphyry country from south-east to north-west. To the north-west it probably intersects a north and south quartz reef which is visible at intervals on the surface.

To the south-east a wedge-shaped mass of red syenite (widening south-eastward) adjoins the elvan on its north-eastern side.

More or less ore was obtained all the way down in sinking the 60-foot shaft.

The rather irregular southern boundary of the dyke and ore is seen in both of two drives which diverge to south-south-east and south 10 degrees west respectively; a few feet south of the shaft the south-south-east drive is carried 14 feet from the shaft, but as after leaving the dyke only porphyry country was met with, driving in that direction has been stopped.

In the other drive, which has been carried 40 feet from the shaft after leaving the dyke, porphyry country has been traversed, with the exception of a syenite vein at 25 feet.

A joint, black with fibrous serpentine, is seen in the roof of the level, and has been followed in the hope that it would lead to the "lode." No tin-ore to speak of has been obtained from the southern limit of the dyke. I believe, however, that if the 60-foot shaft were carried down for a distance and levels driven to the south at intervals to lay bare the face of the southern wall, the dyke would eventually be found to extend southward at a low level.

The 60-foot level has been driven about 100 feet to north 20 degrees east of the main shaft, and more or less of tin ore has been obtained all the way, as shown in the plan (*Fig. 2*). At the south-east corner of the shaft good tin ore is seen in the floor. A large block of ore is also seen on the east side of the shaft.

Under the position of the 28-foot shaft a large mass of good tin ore, mixed with pyrites, is left rising up out of the floor, and a few feet further good ore can be seen both in the floor and roof. At the end of the level is seen a width of 3 feet of chloritic tin ore mixed with quartz.

The "No. 2 lode" is worked on the left bank of the gully, about ten chains up from the No. 1, or gully lode. The plan (*Fig. 3*) shows the surface workings as restored with the help of Mr. Bonnar.

The surface deposit of ore occurred as a large floor lying horizontally on porphyry. It extended north and south, and was 22 feet wide at its southern end, where it terminated abruptly against a vertical joint in the porphyry. To the north about 35 feet the mass split up into three rays or fingers which soon died out.

A little to the east of the rays two shafts were sunk in a north and south line 21 feet apart, the northmost to the depth of 124 feet and the southmost to the depth of 54 feet, on a narrow vertical deposit of ore. Eastward of both shafts floors of ore have been quarried from the porphyry country in the hillside. *Fig. 4* is a section of the workings. The shaded portion shows where ore has been taken out. A level has been driven at 28 feet. There is ore left in the roof  $3\frac{1}{2}$  feet wide. Where the level adjoins the deep shaft the ore is 9 feet thick, and of a quality which I should estimate at 50 per cent. of "black ore." The whole of the ground bounded by the two shafts and by the 28 feet and 54 feet levels has been stoped out. The ore was 16 feet wide at the north end and 18 inches wide at the south end of the 54-foot level. At the north end it appears to be 50 per cent. ore. An east and west bar of porphyry cuts off the ore northward at the point where the shaft intersects the 54-foot level.

The 54-foot level is continued for 65 feet south of the southmost shaft. From the foot of the shaft a shoot of ore has been traced for 35 feet, rising gradually. It is 1 foot in width at the end. For the remaining 35 feet the level traverses coarse porphyry country. A black serpentinous vein is seen in the roof, but no ore.

The matrix of the ore is a dark-green chlorite rock with grains and kernels of quartz. Sometimes reef quartz replaces the chlorite. The chlorite rock is in all probability a dyke, originally erupted as a quartzose diorite, and which has subsequently undergone much alteration. The dyke was probably never continuous at the level of the present surface, but I have little doubt of its connection at some low level with the Erin-go-Bragh (which see).

It will be seen from a glance at the section (*Fig. 4*) that a very large quantity of stone has been taken out, and that a very large quantity is still in sight. The No. 2 lode and Gully lode have fed the Herberton Tin Company's machine for two years. In the experienced hands of Mr. Munday, who has lately taken the management, a systematic exploration will be undertaken, and the Prospecting Company's mines may be expected to take a prominent place among the tin-producing works of the world.

ERIN-GO-BRAGH.

## ERIN-GO-BRAGH.

*Minnis and Reilly.*

Adjoining the prospecting claim on the south, the No. 3 lode of the prospectors (continuation of No. 2) has been opened in a 40-foot shaft, which was full of water. I was informed that a large floor of ore had been taken out.

A new shaft has been sunk by Minnis and Reilly, the present owners. A level cutting, 27 feet in length, has been made into the hillside through the porphyry country, cutting the shaft at a depth of 10 feet. The shaft was being logged up, so that I was unable to see the formation, but some chlorite ore of fair quality had recently come up from the bottom levels. It was partly a greenish rock, in which quartz blebs were enclosed in an amphibolic matrix passing into chlorite, and containing tin ore in minute particles, and partly a slate-coloured serpentine, compressed and jointed, and much veined with green and amethyst-coloured fluor spar.

About 50 yards south-south-east of the new shaft a hole has been sunk on a leader of chloritic tin ore (say 5 per cent.) dipping west, as if to join the lode.

Just on the boundary of this and the prospecting claim a little work was done in 1880 by Coveney and party on the same lode (No. 3 lode of the prospectors), and some good ore was obtained. (*See my previous report.*)

## COTTAIS' CLAIM

Lies in the angle formed by the southern boundary of the prospectors' claim and Jack's road. A vertical shaft has been sunk to the depth of 87 feet. The country is porphyry, often very coarse-grained.

The shaft passes through several slickensided joints, all underlying slightly to the east. On the joints are occasional veins of quartz, sometimes with a little tin ore. *Fig. 5* is a plan of the bottom of the shaft and chamber.

The porphyry country is pierced by a dyke (underlying to the east) of fine-grained, amphibolic rock containing irregular quartz blebs, and with all its joint-planes covered with fibrous serpentine and spangled with thin flakes of native copper.

The dyke is cut off at the south end of the shaft and chamber by a slide or fault, which trends north 40 degrees west, and underlies to the north-east. On the east or hanging-wall of the dyke lies a mass of quartz about 3 feet in thickness, at the north end of the chamber, but narrowing to a thin wedge towards the south end of the chamber, where it abuts against the slide. The quartz is sometimes traversed by veins or interspersed with large crystals of reddish orthoclase felspar. Sometimes it contains a good deal of tin ore. In places the deposit resembles a granite, tin ore taking the place of the missing mica. Twenty tons of stone have lately been crushed with a yield of 21 cwt. of tin ore—a little over 5 per cent. About 5 tons more are lying at grass. The ore is sometimes so finely disseminated through a vitreous quartzite as to be visible to the naked eye only as a colouring matter.

The owners intend to drive to the north on the quartz vein. In this direction they will probably meet, near their northern boundary, the great east and west elvan dyke which runs through the southern part of the prospectors' ground. The quartz (should it continue so far) may possibly be locally enriched by the contact with the dyke, as appears to be the case with the prospectors' No. 3 lode.

A drive from the south-east corner of the shaft, along the slide above referred to, leaving the latter on the left hand, would probably cut the dyke and quartz reef in the position indicated in the sketch, although, in the absence of knowledge of the amount of the down-throw occurring along the slide or fault, it is impossible to say at what distance from the shaft.

## SOUTHERN CROSS.

*Hays, Collins, and Moffat.*

This claim is being worked in a large open cast about 20 feet in depth, from the bottom of which the ore and mullock or refuse is taken out by a tramway through a short tunnel. The main mass of ore runs east-south-east, and the "walls," if they can be so called, have apparently a slight underlie to the north-north-east, while floors of ore dip at a low angle to the south-south-west. The ore is obtained from an open cutting averaging 12 feet wide. It is apparently an altered igneous rock, in places highly chloritic and ferruginous. Two hundred and forty-two tons of stone were lately crushed by the Herberton Tin Mining Company. It was purchased on the ground at 32s. per ton; carting to the machine cost 7s. per ton. As the drays have to take a very circuitous route to the south, west, north, and north-west, a great economy might be effected by running a self-acting tramway down through the Dawn of Hope claim, for which the lie of the ground is very suitable.

Ore has been got in many joints and false walls in the tunnel.

About 15 feet to the north-east is another deposit of ore, parallel to the first and similar in appearance. A good deal of ore is in sight here in an open cast. A 30-foot shaft was sunk in the south-east corner of the open cast. Near the other end of the open cast a mass of ferruginous chlorite ore branches off to the north with a slight hade to the east. To catch this branch a shaft is being sunk in the adjacent claim (the Irish National Land League).

It may be noted that this great deposit of ore occurs a little to the south of the southern branch of the large elvan dyke which intersects the Prospecting, Erin-go-Bragh, and Irish National Land League claims. The elvan may have influenced the production of the tin ore.

## DAWN OF HOPE.

*Hayes and party.*

This claim lies south-west (down hill) from the Southern Cross. As in that claim, the working is hardly mining, but rather promiscuous quarrying, for the reason that no definite lode has been discovered on the ground. A purple chloritic and ferruginous rock, containing more or less tin ore finely disseminated, and for the most part only to be detected by the colour and specific gravity of the stone, occurs all over the walls, but its limits are ill-defined.

Any arrangement there is is a tendency to occur in nearly horizontal floors. The appearance of the deposit (as is also the case in the Southern Cross) suggests penetration by numerous veins of igneous rock, and alteration and mineralization of the country in the vicinity.

A tunnel to the north-east from the present working would, I think, have a good chance of cutting a lode near the north-east boundary of the Dawn of Hope.

The owners intend shortly to crush about 15 tons of stone, which may be expected to yield about 30 per cent. of "black tin." It is purple chlorite, with occasional lumps of tin ore, and some fine tin ore in clay joints, &c., and also a few blocks of quartz with tin ore. There are about 80 tons of poorer stone lying at grass (purple chlorite) supposed to average 6 to 10 per cent. of "black ore." It is not proposed to crush this in the meantime.

Almost anywhere on the ground below the workings a prospecting hole will lay bare the "chlorite" rock.

## IRISH NATIONAL LAND LEAGUE.

*Brown.*

The present shaft (33 feet deep) is sunk in an elvan dyke which runs east-south-east, and is, I have little doubt, identical with that which traverses the north-east corner of the Erin-go-Bragh. From the bottom of the shaft a cross-cut has been driven to the south-west about 16 feet. Near its further end the cross-cut is traversed obliquely by the edge of the elvan dyke. Behind the dyke is a mass of fine-grained serpentinous rock, full of viridite, and containing quartz blebs. The rock is much jointed, the joints being occasionally ferruginous. The cross-cut ends on a north and south wall (dipping east at 65 degrees) of green serpentine rock, coarser in grain than that at the edge of the elvan dyke. It is probably the north and south chlorite ore which is seen in the nearest open cutting in the Southern Cross (the iron here not having been peroxidised).

The cross-cut will be carried further to prove whether or not the serpentinous rock is stanniferous.

The serpentinous rock will of course, in following it to the north, be temporarily cut off by the elvan dyke. It is not shifted, however, as a little way to the north it is seen in a cutting. In that place it is highly ferruginous (peroxidised), and is called by the miners "chlorite ore." It lies on the hanging-wall of an elvan dyke which runs north and south and hades east at 65 degrees. The ore, from its specific gravity, may be suspected to contain perhaps 5 per cent. of tin ore, very finely disseminated. About 30 tons of it are stacked for crushing.

A shaft has been sunk on the east side of the cutting to a depth of 40 feet, but has not reached the ore.

The "chlorite ore" is again seen to the north near the north-west boundary of the claim. Here it is intersected by an east and west elvan dyke.

## SOGGAORTH.

*Casey and O'Donnel.*

This claim is named the Soggaorth (*Celtic*, "Priest") in compliment to the distinguished geologist, the Rev. Julian A. Tenison-Woods, who visited it in 1882.

Just outside of the north-east corner of the claim a trench discloses a vein of serpentinous rock and quartz running east-south-east through porphyry country, and containing a little tin ore.

Near the south-west corner of the ground (between two roads) is a shaft 18 feet deep, with a level driven about 8 feet to the north-west. The deposit of ore ran north-west and underlay to the north-east at about 30 degrees. About 10 tons from here, I was informed, yielded 40 per cent. of black tin ore. What little is left at grass has tin ore interspersed through a matrix of quartz. The level is full of water.

A shallow hole to the north-north-east shows threads of elvan and quartzite, with tin ore and orthoclase felspar crystals scattered throughout.

Another hole has been sunk a little to the north on a vertical vein of quartz between two joints (4 feet apart) in porphyry. A little tin ore occurs associated with wolfram in the quartz and in pockets of red ferruginous chlorite.

A 20-foot shaft has been sunk to the west of this, in porphyry country. Two parallel joints intersect the porphyry, running north 20 degrees west to south 20 degrees east. Between the joints the porphyry is unusually quartzose, and has yielded some tin-ore.

About 16 tons of ore are lying at grass, but are too poor to pay for crushing.

The present main shaft lies to the north-north-east. The lode runs north and south, and hades at 45 degrees to the east. The shaft is 44 feet perpendicular and 20 feet on the underlie. A short level has been driven northward from the foot of the vertical shaft.

The walls are clean and distinct and vary from 12 feet to 3 feet apart. The lode is a vein of serpentine or other alteration-product of a basic dyke. At the end of the level it has diminished to a width of 3 feet, and the hanging-wall is converging towards the foot-wall. The serpentine rock is fine-grained and much jointed.

The

The lode proper as distinguished from the gangue is here represented by three or four inches of quartz or quartzite, much jointed and coated with steatite and noble serpentine. The ore continued from this face for 40 feet up the shaft, bulging in places to 4 feet in width. About 40 tons of stone from this shaft were sold to the Herberton Tin Company and crushed by them. A few fragments of rich stone are left which might yield about 60 per cent. of ore.

#### DEFIANCE.

*Herberton Tin Mining Company.—Mr. PURCELL, Manager.*

The owners have sunk a shaft 80 feet deep on a vertical reef or dyke 4 feet wide, of massive quartz, sometimes passing into quartzite and sometimes into serpentine. The reef runs north and south. About 3 tons of stone are paddocked; it contains much wolfram, some fluorspar, and streaks of tin ore.

From an old shallow shaft a little to the south some good ore has been taken. In the little that has been left here (4 or 5 tons) are a good deal of wolfram and some fluorspar.

A good deal of stone has been crushed. From the first 70 tons (mostly from the old shaft) about 9 tons of "black ore" were obtained (nearly 13 per cent.).

#### NO. 1 EAST GREAT NORTHERN (or CUNNAMULLA).

*Jack, Newell, and Lavery.*

A shaft has been sunk about 50 feet on a nearly vertical dyke, running north 10 degrees east, of serpentine with quartz blebs, traversing porphyry country.

Fifteen feet above the bottom of the shaft a level was driven to the south for about 18 feet. The ore, however, could only be followed for about 2 feet. In the bottom of the shaft the dyke underlies to the east at about 70 degrees. On its underside is a thin vein of quartz, sometimes containing fluorspar.

No stone has yet been crushed. About 3 tons lying at the surface, mixed with quartz and serpentine, may be expected to yield over 80 per cent. of "black ore."

A vein of quartz crosses the porphyry country up the hill, above the shaft. It dips at 35 degrees to the south-east. Good specimens of tin ore were gathered on the surface hereabouts.

#### GENERAL GRANT.

*Taylor, Clarke, and Kelly.*

This mine has been worked in an underlie shaft 60 feet deep. The lode, which is a quartzose serpentine vein, runs east 15 degrees north, and fades at 50 degrees to south 15 degrees east.

The ore followed the hanging-wall (which is very distinct) nearly to the bottom. At the bottom it goes back about 2 feet from the hanging-wall. The stone here is very rich. It is mainly tin ore with a little quartz and quartzite. About 16 tons are lying at grass, and will shortly be crushed at the Co-operative Company's machine. It will probably yield 40 per cent. of ore.

#### NELLY GRANT.

*O'Donnell.*

A cutting has been made here on a joint running south-south-east in porphyry country. The joint is ferruginous and quartzose, and contains some wolfram and some dark mica.

#### LY-E-MOON.

*Donahue, Lavery, and Henriquez.*

The Ly-e-Moon is on a large dyke of finely crystalline-granular green chlorite, which occasionally gives place to quartz to such an extent that it almost becomes a quartz reef. The dyke runs north 30 degrees east. It is nearly vertical, but has a slight hade to east 30 degrees south. It is not less than 25 feet in width. Its west side is clearly seen in a short tunnel connecting the bottom of the present shaft with the hill-side, but its east side has not yet been cut in the workings. Joints running parallel with the line of the dyke have been quite arbitrarily taken for "foot" and "hanging walls." That which is at present regarded as "the hanging-wall" is seen in the east side of the monkey shaft, afterwards referred to; while what is taken for the foot-wall goes down from the other side of that shaft as far as the workings extend.

The first shaft (now filled up) was sunk to a depth of 25 feet, and a level was carried about 10 feet south-south-west. About 20 tons of ore were obtained from this shaft and level and sold to the Herberton Tin Company for £185.

Side by side with this, and to the north-north-east, a second shaft (the one in present use) was sunk to the depth of 32 feet. The shaft is mainly in chlorite country, but bottoms on a "horse" of porphyry.

From the level of the bottom of this shaft a monkey shaft has been sunk 18 feet, and a level has been carried for 18 feet to north 30 degrees east, keeping the so-called foot-wall already referred to on the left hand.

Tin ore has been continuously obtained from the end of this level up to the surface. It mostly lay along the foot-wall, which it occasionally penetrated.

At the present face and under foot there is a large body of stone of excellent quality, chlorite impregnated with probably 60 per cent. of tin ore extending about 4 feet out from the foot-wall.

The

The so-called "hanging-wall," as seen at the top of the monkey shaft, is 10 feet apart from the foot-wall. It is merely a joint-plane in the chlorite. Tin-ore can be seen here also.

The tin ore occurs both in the chlorite and in the quartz, but chiefly in the former. The chlorite varies from a soft dark, homogeneous, green work to one in which quartz predominates, the quartz being enclosed in a chloritic matrix.

Nineteen tons of stone were crushed by the Herberton Tin Mining Company for the owners of the mine, who received 5 tons of "black ore" as the proceeds.

There are now about 60 tons of stone at grass, the result of four months' work of two men. It can hardly yield less than 45 per cent. of tin ore. Some of the stone has an occasional small crystal of wolfram among the tin ore.

### HOME RULE.

#### *Hickey and Slattery.*

This claim lies south of the Ly-e-Moon. The owners have sunk a shaft on the underlie (to the north-west) 70 feet deep. They are obviously working in the same chlorite dyke which carries tin ore in the Ly-e-Moon. Here, however, the chlorite is more quartzose, and is often replaced by reef quartz.

About 12 tons of stone (quartz with perhaps 15 per cent. of tin ore) have been obtained in the course of the work. Tin ore is visible in the present bottom. Some native bismuth was obtained at a higher level.

There is every reason to believe that the long axis of the shaft lies obliquely to the course (north-north-east of the dyke). It would be well if, before sinking further, the dyke were cross-cut near the bottom of the present working by a tunnel driven into the hill below the dyke, and at right angles to its general course (*i.e.*, east-south-east). By this means the question whether or not the tin ore occurs most plentifully along a system of joint-planes parallel to the sides of the dyke, as in the case of the Ly-e-Moon, would be solved in the shortest and least expensive manner.

### HERBERTON IRONCLAD.

#### *Noonan and Hayes.*

This claim is mined by a shallow open cutting reaching about 40 feet into the hill-side along the course of a large dyke of elvan or highly silicated bluish felstone, with much quartz, and frequently becoming altogether quartz. Sometimes there is a little tin in quartz floors. Occasionally masses of frothy greenish decomposed arsenical pyrites are met with. I saw also copper pyrites covered with a coating of sulphate of copper.

There are about 15 tons of stone stacked, but the tin contents would hardly pay for carting to the machine.

In the 3-by-3 chains block two shafts about 10 feet deep have been sunk on the dyke, apparently near its southern edge. In the eastmost of the two shafts a ferruginous joint, coated with hæmatite pimples, dips to the south. About 10 tons of stone from these shafts were sold to the Herberton Tin Company.

This dyke is a continuation of that which is seen near the south-east corner of the Prospecting Claim. It runs through the General Grant, Herberton Ironclad, and St. Patrick on a general course of east 30 degrees north. It has undergone considerable metamorphism, and is perfectly protean in its character, but is easily distinguishable from the adjoining porphyry.

### ST. PATRICK.

#### *Lavery, Tweedy, and Stubley.*

No. 1 shaft, near the south-east end of the ground, has been sunk to a depth of 60 feet. Tin ore was got for the first 40 feet. There was water in the shaft when I visited it. The principal deposit of ore ran south-west to north-east. The stuff coming from the bottom at present is soft coarse porphyry.

One hundred and twenty-five tons of bagging ore were sold from this shaft. About 1 cwt. of most remarkable purity, scarcely inferior to stream tin, is at present lying at grass. It is a compact mass of amorphous ore, with spots of steatite and veins and coatings of serpentine. About 50 tons of "seconds" have been crushed. About 15 tons at grass might yield 40 per cent. of "black ore."

No. 2 shaft lies close to the southern boundary of the claim, and about 50 yards west of No. 1. It has not been sunk on the lode, which has, however, been found in driving from the bottom (58 feet deep) a little to the west. About 20 feet in this direction a "wall" has been met with, underlying to north-north-east. To the east of this, on the north side of the drive, a large body of ore is seen. Large faces are seen of nearly pure, massive tin ore, while considerable masses of quartz, mixed with ore to the extent of, say, one-third in bulk, are met with.

The lode apparently runs to the north-north-east, and heads to east-south-east. It seems to be thrown by some slip (nearly in the line of the drive but not now visible) *down* to the north, for at the same level it is followed, some yards nearer the shaft, to the south-south-west, where it enters the side of the shaft in the St. Patrick No. 1 block. The lode along this level was about 4 feet wide throughout. The greater part of this level is, however, in the No. 1 claim.

About 20 tons of ore have been crushed from here at the Herberton Tin Mining Company's machine. Some 60 tons are stacked and may yield 30 per cent. of ore.

Two more shafts have been sunk on the course of the lode to the north-north-east of No. 2 shaft. The nearest was 60 feet deep and had ore at bottom. The other is just on the side of the great elvan dyke. It is 25 feet deep. Five tons of bagging ore from this claim were sold to Mr. Samper.

Mr. Lavery informed me that a large loose block of stone was obtained at the surface near the site of this shaft. Eighteen cwts. of bagging ore were obtained from this block alone.\*

No. 1

\* 24th April, 1883.—Sixty tons of stone, crushed at the Herberton Co-operative Company's machine, yielded 18½ tons of "black ore."—*Herberton Advertiser.*

## No. 1 ST. PATRICK.

*Lavery and Moffat.*

The level from the bottom of the shaft on the southern boundary of the St. Patrick, a distance of 29 feet, breaks into the shaft of the No. 1 St. Patrick at a depth of about 18 feet. The lode was here 4 feet wide. It is mainly within the limits of this claim.

The shaft follows the underlie of the lode (east-south-east). At the depth of 40 feet the diorite dyke cuts off the lode in the middle of the shaft. It varies very much in character—from a tough felspathic rock, with hornblende and quartz crystals, to a fine-grained greenish diorite of the usual character. The dyke has been driven on for about 20 feet, but has not been cut through.

Near the end of the drive is a wet joint, and for 2 feet the rock is soft enough to be dug out with the hammer.

A cross-cut to the north, 20 feet from the bottom of the shaft, is all in porphyry country.

The ore here has all been obtained from a level extending 29 feet from the bottom of the shaft north-north-eastward to the boundary of the claim.

The lode has been stoped out for 20 feet above this level. Nine tons of bagging ore were sold to Mr. Samper, and twelve tons of bagging ore and twenty tons of "seconds" to Mr. Denny. Sixty tons of stone were crushed for the owners at the Herberton Tin Company's machine, with a result of 19 tons of ore.

## SAINT PATRICK BLOCK.

*Newland and Lynes.*

The present shaft (about 12 feet deep) is on the right bank of one of the heads of the Prospectors' gully. It is on a quartz reef about 2 feet wide, which fades to the east. The foot-wall, which is visible at the bottom of the shaft, is of porphyry. There is a little tin ore in the quartz, but hardly enough to pay for crushing.

The reef is seen on the opposite side of the gully. It is there at least 6 feet wide.

A cutting a little higher on the hill-side is in coarse-grained porphyry country. At the end it strikes a quartzose and ferruginous serpentine containing a little tin ore. About 17 tons of stone from this cutting were crushed by the Herberton Tin Company, and 5 tons at the Co-operative machine.

About 20 tons are stacked, which will probably just cover the expense of carting and crushing.

Near the junction of the claim with the St. Patrick and No. 1 St. Patrick is another cutting ending in a hole full of water. Here is a diorite-like rock much masked with viridite, and highly ferruginous in places. It appears to run north-north-east to south-south-west. Ore to the value of £300 is said to have been taken from this place.

## YOUNG AMERICAN.

*Lavery, O'Donnell, and Julian.*

The owners have done a great deal of work in stripping the surface of a porphyry country traversed by a mass of elvan. They also quarry the rock. Good specimens of tin ore were found loose on the surface. If there be a lode on the ground the method of prospecting which has been adopted must discover it sooner or later.

A block of diorite from one of the quarries enclosed fragments of chlorite-schist, and some wolfram and molybdenite.

## CHANCE. (Registered.)

*Maslin Brothers and Moyne.*

There is here a large mass (running north-east and south-west) of dark-green chlorite, very like that in the Ly-e-moon, but generally iron-masked.

A good deal of stone has been stacked, but none has yet been crushed.

A shaft about 30 feet deep (water) has been sunk near the south-west end of the claim, and there are several cuttings and trenches across the course of the dyke.

## FOY'S CHLORITE. (Registered.)

*John Foy.*

This is a continuation of the Chance dyke, which is visible all the way on the crown of the ridge, on or near the road.

The main shaft (water) looks like 50 feet deep. The description of the dyke in the Chance would answer word for word for the Chlorite. Mr. Denny says that the whole outcrop will yield 3 or 4 per cent. of tin ore. The outcrop becomes more quartzose and less ferruginous and chloritic towards the north-east end of the claim.

## NEW ZEALAND WEST.

Here the dyke which traverses the Chance and Chlorite claims is cut off by the large elvan of the Herberton Ironclad. The latter is seen in a hillock on the south side of the road. It is much iron-stained.

NEW

## NEW ZEALAND.

*Walsh and party.*

This lode runs east and west, and has an underlie at about 70 degrees to the south. A granite foot-wall is seen at the bottom of the shaft, which is 70 feet deep. The lode is a dyke of a dark-blue altered diorite, with a serpentinous matrix full of quartz blebs.

Seven tons of bagging ore were sent to Sydney. Fifty-five tons of stone have just been crushed at the Co-operative Company's machine for a yield of 30 per cent. of ore. A little stone which has been turned out since the crushing consists of quartzose serpentine, spattered with fine-grained tin ore.

A level has been driven from the bottom about 15 feet, and the ore continues to that distance.

Another has been driven southward from the bottom of the shaft without coming to the edge of the dyke, and the ore still continues.

A vein of soft chlorite seen in the cutting at the north of the shaft should underlie the foot-wall of the dyke.

## LOTTERY.

*Stevenson and party.*

The main work consists of a tunnel 155 feet long, driven south 5 degrees east into the hill (porphyry country). At the end the tunnel has just struck a dyke of diorite containing quartz. It runs east 30 degrees north and fades to the south.

The diorite is fine in grain, but with the lens can be seen to contain crystals of amphibole and a triclinic felspar, all much worn and, as it were, felted together with viridite. The thickness of the mass has not yet been ascertained, nor has the rock as yet been proved to contain any tin ore, although, from the similarity of its texture with that of the stanniferous dykes of the district, this may be confidently expected.

## IRISH GIRL.

*O'Regan, Wall, and Walsh.*

The shaft lies due east of the Ly-e-moon shaft. It is in the large elvan dyke, or a branch of it, and on a reef of quartz which runs north 10 degrees east and fades to the east.

Some stone has been sent down to crush, and about 15 tons are lying at grass. The latter consists of chips of quartz and elvan, with minute specks of tin ore. I do not think it would pay for carting and crushing. The shaft looks like 30 feet deep, but has water standing in it.

## NORTH STAR.

*Adams, Bethel, and Henry.*

Here the outcrop of a quartz reef is seen striking west-south-west, and underlying at 45 degrees down the hill to the south-south-east. A shaft has been sunk on it to a depth of 50 feet. The low underlie continues to the depth of 18 feet, when the reef pitches at a much steeper angle. There was good ore from the surface for 30 feet down. Two tons of the stone should yield about 50 per cent. of ore. At the bottom of the shaft the quartz reef is about 2 feet wide and is mixed with tin ore to the extent of about 20 per cent. About 20 tons of this stone are stacked. At the bottom the quartz reef traverses a quartzose diorite passing into chlorite rock.

## WELCOME.

*Lissner, Mitchell, Hodgson, Buchanan, Wilson, Prydie, and Wallace.*

On this claim a shaft has been sunk about 20 feet deep, and at the bottom a large chamber has been excavated to the westward. Although a large quantity of good ore has been obtained, there does not appear to be any very definite lode.

At the western extremity of the working what looks like a foot-wall makes its appearance. It runs north-east and south-west, and underlies at about 65 degrees towards the shaft. On it there lie about 6 feet of quartz with tin ore. About 18 feet above this, and nearly parallel with it, is a quartz reef or vein. Between the two masses of quartz the country is a porphyry of quartz and orthoclase felspar, with portions of the matrix serpentinous. The porphyry is much jointed and traversed by floors of quartz containing masses of felspar and tin ore.

About 20 tons of 50 per cent. ore from the surface have been sold. There are about 50 tons now lying at grass taken from the lower levels. The ore is mixed with quartz (in large blocks) and felspar. The stone paddocked may have 30 per cent. of tin ore. In spite of the irregular and uncertain mode of occurrence of the ore, the result of the working has been so far satisfactory.

## CORNSTALK.

*Owners same as Welcome.*

Near the south end of the ground a shaft 12 feet deep has been sunk on a mass of quartz which possesses the crystalline and ribboned structure characteristic of a true reef. This structure is developed in lines running north 20 degrees east and nearly vertical. That may, therefore, be presumed to be the course of the reef, which must be over 12 feet wide, although its walls are not seen. The quartz is interrupted by a "horse" of quartzose rock passing into serpentine.

The quartz contains a good deal of tin ore in streaks and in aggregations of fine crystals, with some wolfram.

About

About 12 tons of stone at grass might yield 10 or 12 per cent. of ore.

About 30 yards to the north-east an open cutting on the top of the ridge shows a mass of quartz in porphyry, cut off by an east and west dyke of diallage rock (with much quartz) 4 to 6 feet wide. This rock is partly chloritic, and contains a little tin ore. There is also tin ore in quartz.

About 6 tons of stone are paddocked from this cutting.

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#### NOVA SCOTIA.

*Toomey and Judge.*

This is an unsurveyed claim lying on the ridge north-east of the Cornstalk, in porphyry country.

An east and west vein of quartz has been worked in a shallow shaft. About 4 tons of quartz and tin ore are stacked. The ore is mixed with wolfram.

About ten yards to the east of this shaft is another 12 feet deep on a vertical quartz reef, running north and south through porphyry country. There is a good deal of fluorspar in the quartz. Some tin ore occurs in small tetragonal crystals, and also pseudomorphous after wolfram.

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#### GREAT EASTERN.

*Johnson and Ericson.*

A shaft has been sunk 50 feet on an argillaceous chlorite or serpentine, which is sometimes heavy with tin ore, especially beside joints. A reddish ferruginous chlorite cuts across the shaft at the top. In the fine-grained material from the lower levels the ore occurs as a very fine powder. Joint planes are often covered with scales of red oxide of copper. About 100 tons are stacked whose tin-ore contents may average 15 per cent.

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#### WILD IRISHMAN.

*Herberton Tin Company and others.*

The original working is thus described in my report dated 27th October, 1880, shortly after the opening of the field:—

"Its course is south-west and north-east. The north-west wall only is distinct. The lode is about 4 feet wide, and nearly vertical. Quartz and tin ore tend to arrange themselves in 'floors,' which dip to the north-west side. Five tons of ore have been sold on the ground at £10 per ton. Six tons more are lying at grass."

Since the above was written the working has been carried to the depth of 30 feet. It now appears that the general direction is rather east-north-east than north-east. The lode is an altered igneous dyke.

The present workings, a little to the west of the original workings, consist mainly of a shaft 66 feet deep and a tunnel 40 feet in length, carried to south 40 degrees east, and striking the shaft at 25 feet from the bottom. From the bottom of the shaft a wide level has been carried eastward for 25 feet, and the whole stoped out up to the surface.

On the floor of the level the ore is 14 feet wide near the shaft. There is also a drive about 6 feet to south-south-west from the bottom of the shaft. The whole working is in a wide dyke, probably running east and west, of dark altered diorite rock, with quartz granules in a chloritic matrix.

About 180 tons of high-class ore have been crushed. Some 30 tons are stacked, which may yield 48 per cent. of ore.

A mass of chloritic rock is cut by the tunnel near its mouth.

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#### No. 1 WILD IRISHMAN.

*Nash, Tucker, Brown, Williamson, and Boyce.*

Below the road, near the Wild Irishman, a shaft has been sunk in porphyry country. The owners are now driving to the north-east to cut a "blow" of chloritic rock with quartz granules which appears to run north-west, and which may be the same which is crossed in the mouth of the Wild Irishman tunnel.

In the north-east corner of the ground is a shaft 32 feet deep, on a ferruginous chlorite running north-north-east, with a little tin ore. From this shaft there has been brought up some black or dark-blue serpentine with pyrites, and some green diorite with quartz blebs.

In a trench south-east of this shaft is seen an east and west granular rock, having a chloritic matrix and quartz blebs. Angular fragments of tin ore can be picked up in the trench.

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#### SYNDICATE.

*Baker, Daniels, Mullins, and another.*

This mine is in an altered igneous dyke in which quartz blebs occur in a matrix, sometimes of serpentine and sometimes of dark-green chlorite. The rock is sometimes, especially in joints and along faces, fine-grained, like a dark slate, and heavy with finely disseminated tin ore. A shaft has been sunk on the dyke about 60 feet deep. Joint-planes are quite arbitrarily treated as "foot" and "hanging" walls. The stone is removed from a thickness of 13 feet.

The "foot-wall" is coarse and crystalline, and is probably nearer the middle than the edge of the dyke. Good tin ore is being taken out from near the "hanging wall" at the foot of the shaft. The dyke carried the tin ore here for 8 feet across, as seen in the floor.

A level

A level has been driven from the bottom of the shaft for 35 feet to the south-east, and ore has been stoped out for 20 feet up.

At the south-east end of the level, especially on the "hanging wall," the dyke gets very quartzose, and a face of granular quartz is met with running north and south. This is believed to cut off the tin ore in that direction.

Twelve feet above this level another goes 30 feet further in the same direction, but although a very distinct "hanging wall" leads all the way no ore has been found. It is more than probable that it continues parallel with the level on its south-west side, the slip met with in the end of the lower level having thrown it in that direction.

The rock in the upper level is hard and quartzose, with a sparse matrix of serpentine and chlorite.

A second shaft has been sunk to the depth of 15 feet, close to the deep shaft, on its north-west side. A short drive eastward from the bottom follows a quartz reef, which intersects the dyke and underlies to the south. On the foot-wall of the reef a mass of good tin ore is seen about 6 feet above the drive. The shoot of ore, however, seems to have crossed the reef, as it continues across the main level to the place whence the ore is being raised at present. Porphyry is seen on the east side of the main shaft, and also in the mouth of the cutting on the hill-side below. The course of the dyke, which must be a wide one, is probably north-west and south-east.

Some "bagging" ore was sent away from the claim at first. No stone has yet been crushed. At the top of the shaft are about 40 tons of stone—large lumps of quartz spattered with tin ore, adhering to lumps of serpentine and chlorite, and sometimes coated with flourspar. Often the stone is coated with fibrous serpentine. I estimate the ore contents at 5 per cent.

Another parcel of stone has about 40 tons of black "slate" ore—fine grained serpentine coated with fibrous serpentine. The tin is scattered very finely throughout. Sometimes the "colour" is visible, but often the presence of the ore is only to be detected by the specific gravity of the stone. The serpentine has blebs of quartz. I should estimate the tin ore contents at 10 per cent.

There are grassed from the lower levels and open cutting 70 tons of very good ore—chlorite mixed with quartz, the chlorite sometimes almost entirely replaced by tin ore—say 30 per cent., and 50 tons "seconds"—mixed quartz and serpentine, which may average 5 per cent. of tin ore.

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#### HOPEFUL.

A shaft is being sunk in porphyry. It is now 80 feet deep. A 2-feet dyke of elvan, with quartz blebs, runs north-north-east at the south-east end of the shaft.

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#### LONDON.

*Herberton Tin Company.*

Here a shaft (now 95 feet deep) is being sunk in porphyry country. The bottom shows a "hanging wall" of a hard mixture of quartz and serpentine.

At the depth of 80 feet a little tin ore was obtained from a dark serpentine, which ran east and west, with a quartz reef in connection with it.

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#### ALMA.

Several shafts have been sunk on the ground. The newest (northmost) is about 45 feet deep, and bottoms on a rock having a hard green serpentinous matrix enclosing blebs of quartz. The rock is sometimes pyritous. For 30 feet deep (as far as the ladders extend) the rock is a coarse porphyry. A little lower the shaft is connected by a drive with an older shaft to the south. A few hundredweights of quartz with a little tin ore are the last product of the new shaft.

In the old shaft a similar rock is passed through. The underlie is to east-north-east. About 7 tons of stone of the first-class (quartz with tin ore), say 20 per cent., and about 15 tons of "seconds," are lying at grass.

On the "foot-wall" (as seen from the top) there is some ferruginous chlorite.

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#### GLANMIRE.

*McGrath, Downey, and Maloney.*

The Glanmire is a joint in porphyry, running up the hill. About 12 tons of stone are stacked, mostly wolfram with a small proportion of tin ore. About 6 tons of similar stone were carted down but not crushed. Such ore, if carriage were reasonable, might be profitably treated in England, as the wolfram can be roasted with carbonate of soda and reduced to tungstate of soda, which is not only easily separable from the tin ore, but can be used as a mordant in dyeing, and for other purposes.

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#### STAR OF THE SOUTH.

This abandoned claim lies between the Glanmire and Brisbane United. An open cast and short tunnel in porphyry country represent all the work done, which has been merely prospecting.

I found about half-a-pound of rolled pebbles of plumbago scattered in the bottom of the tunnel. These have probably been washed from some of the heads of Nigger Creek, but I could obtain no information on the subject.

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#### BRISBANE

## BRISBANE UNITED. (Registered.)

*Buckland, Brookes, Baynes, Bartley, Baxter Bruce, and Walker.*—Mr. PEMBERTHY, Manager.

This claim lies on the southern or Nigger Creek fall of the St. Patrick Hill.

A true quartz reef runs up the hill in a west 30 degrees north direction. It fades to north 30 degrees east at about 60 degrees. A shaft has been sunk on it in its upper portion about 30 feet deep. In the bottom of the shaft the reef is about 2 feet in thickness, with 2 feet of brecciated gangue below it. About 5 tons of stone are at grass—quartz spattered with tin ore to the extent of about 2 per cent. in bulk. About 10 tons of stone are stacked and bagged for carriage to the machine. The stone is registered as belonging to James Bethel, the former owner. It consists of quartz and tin ore, the latter in a proportion which I should estimate at 8 per cent. on an average.

From the lower levels about 25 tons have been taken out and bagged, apparently by the present proprietors. It is pretty much like that from Bethel's work. The stanniferous quartz occurs in large blocks.

A tunnel has been driven at a lower level than Bethel's work, on the course of the lode. Here the reef underlies to west-south-west at 60 degrees, although in Bethel's working it has an underlie in the opposite direction. A shaft has been sunk in the bottom of the tunnel to about 20 feet deep. The reef has been stoped out right and left from the bottom of the shaft for 12 feet up on the north, and up to the tunnel on the south. There are distinct enough walls of porphyry in the bottom of the shaft, but no quartz.

## BLACK KING.

*Moffat and Denny.*—Mr. JONES, Manager.

Here at the mouth of the shaft a quartz reef, 4 feet in width, is seen running east and west, and apparently underlying a little to the north, through porphyry country. A thickness of about 2 feet is very rich in tin. The shaft is 110 feet deep. Subjoined is a section of the workings. (Fig. 7.)

The lower levels were inaccessible at the date of my visit. At the 55-feet level the plan (Fig. 8) was sketched.

Several hundreds of tons have been crushed at the Herberton Tin Company's mill. A large quantity has just been carted down. About 4 tons of very good stone are left, containing perhaps 50 per cent. of tin ore.

## ORIENT.

*Arbouin, Power, Thomas and Malden, Fox and Leyhey.*

This unsurveyed claim lies on the south side of the Black King hill.

The westmost working is a large open cast on veins of red chlorite heavy with minute grains of tin ore, which are only to be seen as a rule after the rock has been crushed and washed. The chlorite veins run chiefly from east to west, and are obviously altered igneous dykes intersecting the porphyry country.

About 60 tons of chlorite ore are stacked. Three chains to the east is a shaft 50 feet deep (water) in porphyry country.

There are about 2 feet of red chlorite overlying 2 feet of quartz. The stone from the bottom level is peculiar, and quite unlike anything else on the field. It consists of a dark-brown aggregation of minute spangles of talc, enclosing sparse blebs of quartz, with occasional streaks of pale-green carbonate of copper. I obtained fine tin-ore from this by crushing and washing. About 50 tons of this are stacked.

## SHAMROCK.

*Burke and Webb.*

The Shamrock lies on the Nigger Creek fall of the hill to the east of the Black King.

There are two workings. The upper is a large open cast on the course of a north and south diorite dyke. The dyke is partially altered to a dark chlorite with quartz blebs. Only the west side is seen, and the dyke must be over 8 feet wide. A shallow shaft has been sunk in the bottom of the cutting. There is a slight underlie to the east. The dyke is full of joints parallel to its course. A floor of stanniferous quartz lies across the dyke nearly horizontally.

About 25 tons of stone from the surface are stacked here—a coarse-grained quartzose diorite, the quartz stained with tin ore. The tin ore may form 2 per cent. of the whole.

About 25 tons from the bottom of the cutting are rich; very similar in character to the last mentioned heap, except that the stone is less weathered. The tin ore is more distinctly seen, and is perhaps present in rather larger proportions.

Down the hill (to the south) is another cutting made by former owners of the claim. It is on a diorite dyke, which apparently runs east-south-east. The sides of the dyke are not seen. There is quartz in the middle of the working, and at the bottom the quartz shows freely. Some stone was crushed from here; I could not learn how much. A little which is left might yield 8 per cent. of tin ore.

## THREE STAR.

*Buckland and Hoare.*

This claim presents the peculiarity—almost without parallel on the field, although so common in Cornwall and elsewhere—of an elvan dyke containing payable tin ore.

The elvan is of the usual type—a silicated felstone, with quartz blebs. Its western side is seen in the west shaft with porphyry adjoining. The shaft is 25 feet deep. The elvan runs north 20 degrees west, and goes down vertically in the shaft. At about 10 feet deep the elvan becomes mixed with vein-quartz and the matrix becomes serpentinous, the quartz blebs still remaining distinct. Fair tin ore occurs in the shaft here.

One chain to the east three shafts are sunk on the course of the dyke. The northmost is 12 feet deep. The central and southern each 40 feet. The elvan is much mixed here with vein-quartz. A little stone is left—quartz with tin-ore. About 50 tons of stone were bought on the ground by the Herberton Tin Company for £16 10s. per ton.

A shaft about  $1\frac{1}{2}$  chains to the east has been sunk 50 feet. The eastern edge of the elvan is seen in a cutting at the surface. The width of the dyke is therefore about 100 feet. In the shaft, at the depth of 40 feet, is a 2-foot quartz vein with tin ore at the junction of the elvan with porphyry. A wedge-shaped diorite mass, partly decomposed and partly very hard and quartzose, comes in at the north end of the shaft, as shown in the sketch-plan (*Fig. 9*).

Backs or joints containing tin ore underlie to the north-west.

Over 60 tons of stone have been taken out of this shaft. The first 40 tons were sold to the Herberton Tin Company. The rest is stacked on the ground. It contains some fine large blocks of massive tin ore associated with quartz.

### NEW DALCOATH.

*Hill, Beaufort, and White.*

The new southmost shaft is 35 feet deep, but the lower levels, at the date of my visit, were inaccessible. At the 16-foot level is a mass of reef-quartz 6 feet or more wide, apparently running north-north-east and hading to east-south-east. Porphyry is seen on the east-south-east side. A 1-foot dyke (vertical) of decomposed diorite runs north and south through the quartz. A little tin ore was obtained at this level. There is said to be only a trace below. A drive is being started to the west in search of a "foot-wall." The large elvan dyke of the "Three Star" is seen on the surface only a few yards to the west.

Near the middle of the new Dalcoath's northern boundary a shaft has been sunk for 65 feet on the edge of the large elvan dyke, which here runs north 20 degrees west, and hades a little to east 20 degrees north. Here a stragglng quartz reef lies between the elvan and the porphyry country, but it contains no tin ore. At about 20 feet from the bottom a course of grey decomposed diorite cuts north-west to south-east across the quartz. When brought to the surface this decomposes to a pulp.

### MONARCH.

*Monarch Tin Mining Company.*

The plan (*Fig. 10*) shows two long tunnels (rails laid in both). The southmost is 150 feet long, and runs west 10 degrees north. The greater part of this tunnel is through coarse porphyry, but at the south side of the mouth of the tunnel, and again at about 20 feet from the inner end, is a dark, hard, fine-grained diorite with hornblende matrix and blebs of quartz. The hornblende is sometimes partly altered to chlorite. On the north edge of the diorite, where it comes into the tunnel, near the inner end, were about 6 inches of arsenical iron pyrites.

Above the mouth of the northmost tunnel is cutting No. 1. Here about 50 tons were obtained of coarse-grained quartz with tin ore. It looks like 15 per cent. stone. The quartz seems to run east 20 degrees north.

No. 2 cutting is to the west, at a level of about 60 feet above the tunnel. It is carried to the west, the north side being in porphyry country. The south side is diorite, with quartz blebs and a matrix altering towards chlorite. This rock cuts obliquely across the cutting to the north side at its inner end. At the inner end of the cutting the dark rock was 12 feet wide at least, but its south side was not seen. It became very quartzose in parts, and carried tin ore. Here a winze is being sunk to deliver the ore at the end of the southern tunnel, which will be reached at a depth of 60 feet.

In front of the end of the cutting is a quarry of black rock 40 feet high and 80 feet across. The rock contains more or less tin ore throughout.

About 100 tons are stacked from the upper workings of very varying character—sometimes very poor, sometimes rich and massive. It may average 15 per cent.

About 600 tons have been raised altogether. The greater part has been sold to and crushed by the Herberton Tin Company. The Monarch Company is erecting machinery at Nigger Creek for the treatment of their own ores.\*

### LEVIATHAN.

*Baker and Daniels.*

The workings here consist of a tunnel 60 feet in length at a low level on the hill-side, and at a level of about 30 feet higher an open cutting with a shaft in the inner end.

In the inner end of the open cutting is seen a dyke of altered diorite, with quartz blebs in a matrix approaching chlorite. This has been quarried on a face to the depth of about 15 feet, and has yielded tin ore. A shaft has been sunk on it to the depth of 20 feet, and the stone has been stoped out from the level of the tunnel up to the level of the shaft.

About 60 tons of stone are stacked—quartz with patches of greenish chlorite, and very black tin ore; also, a little wolfram and iron pyrites and fluorspar. This should yield at least 20 per cent. of black tin ore. About 25 tons of "seconds" might yield 5 per cent.

A considerable quantity of stone from the Leviathan has been crushed by the Herberton Tin Company.

### BRADLAUGH.

\* February, 1883.—The machine is now at work. 13th March, 1883.—The manager reports that a trial crushing of 120 tons has yielded 30 tons of "black tin," and that the total stock of stone raised amounts to about 1,000 tons.

## BRADLAUGH.

*Murphy, Collins, and Maher.*

This claim lies to the east of the Leviathan. There is a short open cutting on the side of the hill, with a 20-foot shaft sunk in the end. The shaft is on a dyke of dark-green chloritic altered diorite, which runs north-north-west, and underlies east-south-east at 35 degrees. Only the hanging-wall of the dyke is seen, but its thickness is at least 20 feet. It contains tin ore irregularly interspersed. About 4 tons are stacked. The stone is very black, and heavy with very fine-grained tin ore—probably as much as 50 per cent. of the latter.

There are also about 30 tons of "seconds" with tin ore amounting to perhaps 12 per cent. This is a dark, fine-grained, chloritic stone, ferruginous in parts, and impregnated with tin ore and a little wolfram.

## PHOENIX.

At the bottom of the principal shaft, 49 feet deep, is seen a foot-wall of porphyry running east and west and dipping north at 60 degrees. On this foot-wall lies a mass of hard dark pyroxenic rock with large quartz blebs in a granular matrix, which is partly altered to serpentine. This is at least 4 feet wide and is probably a dyke. The rock is often entirely replaced by tin ore. A grand face of the latter, 6 feet high, is seen on the north side of the shaft. The ore is coarsely granular, and has large quartz crystals imbedded in it. At the top of the shaft is a dark fine-grained hard rock, like the stanniferous rock of the Birthday (which see). A little iron pyrites comes in at the lower levels. About 30 tons of stone from this shaft might yield 40 per cent. of ore.

In a shaft 30 feet deep, a little to the south-west, a large quartz reef underlies on the whole to the north. Tin is seen freely throughout the quartz, but is most concentrated on joints at right angles to the plane of the underlie. There is a drive of 30 feet to the south, all in the quartz, which must be of great thickness.

The quartz reef underlies and is close to the dyke in the other shaft, and is probably connected with it at a depth.

In the north-west corner of the claim is an elvan dyke, which runs north-eastward to the top of Mount Ida. Near the south-east corner is a large quartz outcrop, probably the continuation of the Defiance lode.

## SCOTSMAN.

*Rice and Herberton Tin Company.*

Here a shaft 80 feet deep is sunk on the underlie (to the north) of a very large coarse-grained diorite dyke. The sides of the dyke are unseen. Tin ore came in on the east side of the shaft at the depth of 30 feet, and was followed on a shoot down to the west for about 30 feet. About 10 tons were crushed. Thirty tons remain at grass—quartz, and say 15 per cent. of tin ore.

The holder of the claim intends to sink near the boundary to catch the Phoenix lode, which dips into his ground.

## BIRTHDAY.

*James Hornemann.*

This is a dyke of dark fine-grained serpentine, almost like a slate in texture, but containing quartz globules and mixed with segregated quartz. The dyke runs west-south-west, and dips to south-south-east at 65 degrees. It is about 8 feet wide—a manageable thickness. The stone from the surface downward is very heavy, and fine tin ore can be got throughout by crushing and washing. The tin ore is scarcely visible in the dark-coloured stone, but its presence is easily distinguishable by the high specific gravity. Some of the stone is very rich in tin ore, containing perhaps 40 per cent.

A machine site has been applied for by the owner, down the gully in a very suitable position. A machine here would be available for an important group of claims, including some which have a large output.

## LEVANT.

*McSherry, O'Dogherty, Hoskins, and Slattery.*

At the end of the road is an open cutting with a shaft at the end reaching to a cutting at a lower level. The upper cutting shows an elvan dyke, say 6 feet wide, running south 20 degrees west. Tin ore occurs in masses of serpentine and quartz, with false walls parallel to the elvan dyke. About 12 tons of black serpentinous ore, say 35 per cent., are at grass.

Fifteen tons of similar stone were sold to the Herberton Tin Company. There are also about 50 tons of "seconds"—say 8 per cent.—mixed serpentine, chlorite, and quartz.

The lower cutting above referred to is 10 feet below the other. It goes obliquely through the elvan dyke. A hard greenish serpentinous rock lies on both sides of the cutting where the latter strikes the shaft. A little serpentine, heavy with tin ore, is left standing on the east side of the cutting.

The level is driven a few feet beyond the shaft, in a dark heavy quartz or quartzite with much pyrites on joints and a little tin ore. The shaft is sunk about 9 feet below the level of the cutting. The lowest, 8 feet, from which tin ore is said to have been obtained, has been filled up. Fourteen tons of stone were sold to the Herberton Tin Company. About 9 tons more are stacked. Three tons of it may contain 5 or 6 per cent. of black tin ore. The rest contains hardly any. There is a good deal of pyrites in the stone, and some joints are coated with fluorspar.

About

About 40 feet above the level of the road is a short open cutting to south 15 degrees west, with a 23-foot shaft at the end of it. From the surface here were taken some red "chlorite ore" and lumps of pure tin stone. The "chlorite ore" is like that of the Southern Cross. It ran east and west at the back of the shaft. It appears to be an elvan dyke much decomposed, and with serpentinous and quartzose parts. About 4 tons of this stone are stacked. It might yield about 20 per cent. of ore. There are also about 10 tons of second-class stone, mottled red and ferruginous, and containing perhaps  $\frac{1}{2}$  per cent. of tin ore. There are also about 10 tons of blue-grey chlorite rock, said to yield some tin ore on roasting. It does not appear to have more than 2 per cent. of tin ore.

The shaft was being slabbled up when I visited the mine, so that I did not see the bottom.

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#### WHEAL VOHR.

This mine is owned by a Brisbane company, and is managed by Mr. John Layland.

The country is granite, but the ore occurs in a peculiar rock whose limits are not traceable, but which was, probably, originally erupted among the granite and subsequently metamorphosed. A shaft has been sunk on it to a depth of 48 feet. The tin ore seems to run north-east and south-west.

The rock which forms the matrix of the tin is without parallel on the field. It is massive penninite or hydrous talc, which can be scratched with the finger nail. Sometimes it occurs in fine apple-green scales. The rock is grey at the surface, but becomes greenish at the lower level. Copper pyrites and tin ore are interspersed throughout, especially in agate-like bands round certain small isolated masses of quartz. The tin ore is very black. About 20 tons of stone are stacked containing 3 to 8 per cent. of tin ore.

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#### DEFIANCE.

*Herberton Tin Company.—Mr. PURCELL, Manager.*

The owners have sunk a shaft 80 feet deep on a vertical reef or dyke, 4 feet wide, of massive quartz, sometimes passing into quartzite and sometimes graduating into serpentine. The reef runs north and south. A good deal of stone has been crushed from this shaft. About 3 tons are paddocked. The stone contains much wolfram, some fluorspar, and streaks of tin ore.

From an old shallow shaft, a little to the south, some good stone has been taken. In the little that is left here (4 or 5 tons) are considerable quantities of wolfram and fluorspar. About 70 tons of stone in all (mostly from the old shaft) have been crushed from this claim. From the first 57 tons about 9 tons of ore (nearly 16 per cent.) were obtained.

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#### DAY DAWN.

*Dow and Clarkson.*

This claim, which originally belonged to the Herberton Tin Company, has been worked by an open cutting and a shaft 25 feet vertical and 15 feet on the underlie, and in a short drive to the north-east at a level of the bottom of the vertical shaft. The lode trends east 40 degrees north, and has a very slight underlie to south 40 degrees east. It follows the "foot-wall" of a serpentinous and quartzose diallage dyke. A shoot of quartz dips to the north-east from the bottom of the vertical shaft, and carried tin ore 15 feet in that direction and about 10 feet to the rise.

The contact-plane of the dyke with the porphyry country was found by driving about 6 feet south-east of the joint-plane, which had previously been regarded as the foot-wall.

In the open cutting, 6 or 8 feet down hill from the shaft, a thin vein of ferruginous and stanniferous serpentine crosses the dyke.

About 100 tons were crushed from this claim. The present owners have about 8 tons at the machine which they expect will yield 30 per cent. of tin ore.

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#### TRUE BLUE.

*Frank Brown.*

This claim lies about a furlong south of the Queen, and adjacent to the Big Ben.

A shaft has been sunk 35 feet on a joint-plane running south-east and north-west, and underlying slightly to the south-west. Along this wall is a vein of iron pyrites and arsenical pyrites varying up to 2 inches thick. A shoot of quartz with tin ore dips to the south-east, and appears as if it were going to follow down the side of a north and south diorite dyke which crossed the shoot at its lower end. About 13 tons of stone from this shaft are in the Co-operative Company's yard. Twelve tons were formerly sold to and crushed by the Herberton Tin Company.

Thirty feet to the north a shallow shaft has been sunk on a vein which runs east-north-east and dips south-south-east. About 5 tons of stone were got from here, 2 tons of which were "bagging ore." The ore occurred in quartz here and was as fine as flour.

About 53 feet south-west (up hill) from the first-described shaft is an old hole, from which about 2 tons of ore were obtained in the early days of the field. It was very pure ore, and occurred in a quartz reef which runs north 30 degrees west, and underlies at 45 degrees to west 30 degrees south. Some wolfram and tin ore are seen in what is now visible of the quartz.

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BLACK

## BLACK CHIEF.

*Conn. Flynn, Pat. Finucane, and Herberton Tin Company.*

Here a tunnel has been driven into the hill-side to east-north-east for 150 feet, where it strikes a north-west and south-east quartz reef containing a little tin ore. The reef is well defined, and varies up to 12 feet in width. It hades at 75 degrees to north-east. A level has been driven on it about 20 feet to the south-east from the inner end of the tunnel. A shaft has been begun from the inner end of the tunnel; it is at present 4 feet deep. Three tons of ore from here may be expected to clear carting and crushing expenses. Another shaft has been sunk from the surface above to the depth of 27 feet. It should reach the level of the tunnel at 38 feet.

An old shaft has been sunk on the north end of the reef to the depth of 27 feet. One ton of stone from this shaft just paid for carting and crushing.

## SILVER KING.

*Herberton Tin Mining Company.*

A shaft has been sunk here on the underlie (to the east) of a north and south dyke of altered diorite.

A drive 10 feet to the south-east connects the bottom of the underlie shaft with a vertical shaft at the level of 72 feet. The vertical shaft is sunk 12 feet deeper. Here a second diorite dyke comes in, dipping to the south.

## CLYDE.

*Herberton Tin Company.*

This claim lies on a high platform to the north-west of the Silver King. A shaft has been sunk 35 feet on the underlie (to the east) of a soft red rock, with a thin rubbly quartz reef on top. Tin ore to the value of £200 was obtained down to 30 feet.

Thirty feet to the east a vertical shaft has been sunk 85 feet—the first 72 feet in similar red rock and the remainder in greenish porphyry with felspar, quartz, and soft green chlorite replacing some other mineral, probably amphibole. At the bottom a dark-blue serpentinous rock, enclosing grains of quartz, seem to run west 10 degrees south and to underlie south 10 degrees east. A north-north-west elvan dyke is seen on the surface west of the workings.

## NEW CHUM.

*Herberton Tin Mining Company.*

Just outside of the claim to the west of its north corner is an old shaft on a north and south dyke of dark fine-grained chlorite rock and fibrous serpentine underlying slightly to the east, in porphyry country. About 8 tons of the rock are stacked—heavy and evidently containing a small proportion of tin ore.

A little to the east of south of the old shaft, and just within the boundaries of the claim is the shaft now in use. It is 57 feet deep, on a quartz reef, which runs north and south and underlies to the east. At 35 feet a level is driven for 25 feet to the south. It is very irregular, as it follows the angles of a rough porphyry wall. Near the south end of the level the quartz is crossed by a thin elvan dyke running west 30 degrees north to east 30 degrees south. Tin ore is seen in the quartz on the lower side near the shaft. At the end of the level a large dyke of quartz with a sparse serpentinous matrix intersects the reef, running south 25 degrees east and underlying to east 25 degrees north at 60 degrees. A shaft has been sunk on this by former owners. Good tin was obtained in the quartz on the top of it. About 60 tons were crushed from the surface, from which some "bagging" ore was also obtained.

At the bottom of the present shaft (57 feet) a dark quartz rock, with a sparse serpentinous matrix, comes in on the south side of the shaft and apparently underlies to the north. This may be the dyke which is seen in the old shaft. From this up to the 30-foot level the shaft is in porphyry country.

## SURPRISE.

*Olsen, Winbury, Stephenson, Nicholson, and Armstrong.*

The present shaft is 84 feet deep on the underlie (to west 30 degrees south at 45 degrees). A quartz reef comes down to about 22 feet from the bottom with a dark-reddish granular chloritic rock on the top. At 22 feet from the bottom the red rock pinches down on the quartz and the ore begins to improve. A black decomposed pyritous diorite (granular) comes in at the bottom of the shaft. Fifty-seven tons of stone from this shaft were crushed at the Co-operative Company's machine. It yielded 16½ per cent of "black ore." It was sold on the ground for £6 per ton. About 10 tons more are stacked. It came mainly from the roof, and is a mixed chloritic talcose and quartzose rock with ferruginous joints. Some parts are very heavy. The tin-ore contents may average 15 per cent. throughout. Ten tons more are said to have been raised since my visit.

A new shaft is sinking to the north in an elvan dyke. It is at present 12 feet deep. The direction of the elvan dyke is still uncertain.

In the block claim, to the north-west of the 12-foot shaft, are two shallow shafts connected by a drive on a north-east and south-west dyke which hades to the north-west at a low angle. The dyke has a tough chloritic matrix enclosing blebs of quartz. About 5 tons of good tin ore were got from here.

## NANCY

## NANCY LEE.

*Finnegan, Craig, and another.*

A shaft has been sunk to the depth of 60 feet on the underlie (to north 10 degrees east) of coarse-grained diorite dyke with veins of quartz containing traces of tin ore. The quartz veins lie parallel to the underlie of the dyke. They are sometimes 6 inches wide, alternating with the diorite. At the bottom of the shaft the quartz is about 4 feet wide, with tin ore in the lower part.

## LOUISA.

*Lindsay, Mirks, and Lee.*

This mine is on a dyke of a hard coarse-grained diorite, with a quartz vein underlying it. The dyke runs south-south-east, and underlies at 30 degrees to east-north-east. A shaft has been sunk 20 feet vertical and 25 feet on the underlie of the dyke. At the bottom is a vertical shoot of quartz with converging dog-toothed crystals. In the spaces between the crystals are galena and a little tin ore. This shoot seems to dip down the underlie of the dyke (*i.e.*, east-north-east).

## POOR STROLLER.

*Herberton Tin Mining Company.*

The main shaft is 50 feet deep. At the depth of 25 feet a prospecting level has been driven for 25 feet to the south. This is above the hanging-wall of a 10-foot vein of a rubbly quartz with a floor of tin ore. Almost all the way the level is in a greenish rock with sparse chloritic base and blebs of quartz.

A level has also been driven to the north. In the level and above it there was good tin ore, which was stoped out for 20 feet from the shaft. At 20 feet from the shaft a tunnel goes out to the east about 20 feet, and the roof has been worked up. There is also a shaft (now filled up) 40 feet deep, sunk by the original proprietor. The level continues to the north for 63 feet beyond the tunnel. Near the end the porphyry country is touched, but the rest of the level is a dark, hard rock with serpentinous matrix and quartz blebs.

About 100 tons were crushed lately; I did not learn with what result. About 12 tons of very good ore are at grass from above the level to the north. It is a high-class ore mixed with quartz and fluor-spar. There are 3 tons of "seconds."

## BIG BEN.

*Tierney and Tracey.*

The Big Ben claim lies on the top and east side of Specimen Hill, within a mile of the Herberton Co-operative Company's machine. An admirable site for a machine has been taken up by the owners of the claim on the creek immediately to the west.

The principal feature of the claim is a dyke of quartz diorite, with its original augitic and olivinous constituents altered to serpentine. Its direction is north-east to south-west. Its thickness is not seen, but it cannot be less than 38 feet.

This dyke is intersected by an east and west to east-south-east elvan dyke, which is traceable across the top of the hill into the St. Mungo's ground. Where it crosses the large diorite dyke of the Big Ben its course is east-south-east. On the opposite side of the elvan dyke the diorite dyke is apparently represented by two diverging dykes of smaller dimensions. One of these, on which the main workings of the Maori Chief are situated, runs west-south-west, and the other, near the north boundary of the Maori Chief, runs nearly east and west.

At the date of my first visit (27th September) the Big Ben workings were conducted at the 20-foot level in a shaft 45 feet deep, sunk near the northern limit of the ground. A stage at the bottom of the shaft prevented my seeing the lower workings. A run or shoot of quartz with tin ore came from north-east to south-west from the surface down the shaft into the 20-foot level.

Some 10 tons of ore were being carted down to the Co-operative Company's machine. It will be crushed shortly.

On my second visit (23rd November) the shaft had been cleared out to a depth of about 35 feet. At the 20-foot level a short drive had been made from the west-north-west end of the shaft, and quartz and rich tin ore were being obtained from a lead or joint which dips towards the shaft at 45 degrees. At the lower level (35 feet), quartz and tin ore were also being raised to the north-west of the shaft from behind a joint which had formerly been regarded as a wall.

About 100 feet to south 30 degrees west of the shaft is an open cutting from the hill-side into the dyke. Here the dyke is traversed by large blocks and veins of quartz carrying tin-ore freely. About 10 tons of quartz and tin ore were lying at grass here, probably containing about 15 per cent. of tin ore.

About 120 tons of stone from the shaft and cutting have been sold to the Herberton Tin Company. A tunnel has been commenced at a lower level (about 45 feet down the hill).

## MAORI CHIEF.

*Tierney and Tracey.*

In the Maori Chief's ground a shaft has been sunk on the southern branch of the diorite dyke to a depth of 70 feet. At 30 feet a level has been driven to east-north-east for a distance of 50 feet. The dyke has an underlie of 65 degrees to south-south-east.

Tin ore was obtained, I am informed, for the greater part of the way along the level. It was to be seen at the date of my visit in a mass of quartz at the extreme end of the level. The quartz occurs in the centre of the dyke. There is very fair tin ore below the level at the east-north-east end of the shaft, but in the shaft itself below the 30-foot level no ore was obtained.

About

About 20 tons of ore, I was informed, had just been carted down to the Co-operative Company's machine.

There is strong reason to believe that the shoot of tin ore occurring in the 30-feet level of the Maori Chief underlies to the east-north-east—*i.e.*, towards the elvan dyke. The shoot in the shaft of the Big Ben on the opposite side of the elvan also makes on the whole towards the elvan. The northmost diorite dyke in the Maori Chief is quite unproved. The three diorite dykes ought to join near the spot where the elvan dyke crosses. It is highly probable that the re-opening of the ground by the elvan dyke may have enriched the tin deposits in the diorite dykes, and it is at the point of intersection of the diorite dykes by the elvan that I should look most hopefully for a large deposit of ore.

## QUEEN.

*Prydie and others.*

The Queen claim lies between the Big Ben and Surprise.

No. 1 shaft is near the eastern boundary of the ground. It is 30 feet deep (20 feet on the underlie) in a mass of reef quartz which carried more or less ore from the surface. From the bottom a drive has been made about 15 feet to the west. The ore occurs in spots and streaks in a matrix of quartz. Thirty-five tons have been crushed at the Herberton Tin Company's machine. The lode is much better defined than is usual on the field.

A large diorite dyke passing into serpentine occurs in the gully above No. 1 shaft. Although not much tin ore is visible, it yields "prospects" when crushed. As the rock has simply to be quarried the supply is unlimited. Should it even contain five per cent. of ore it would pay well for working. About 30 tons of the diorite have been quarried and paddocked awaiting crushing.

No. 2 shaft is 18 feet south-west of No. 1. It is 28 feet deep, and is sunk on a well-defined reef or lode running east 30 degrees south, and 2 feet 6 inches to 3 feet 6 inches wide.

About 10 tons of stone raised from this shaft have been crushed by the Herberton Tin Company. Some very fair quartz ore,—say 30 per cent. of "black tin," lies at grass.

No. 3 shaft is about 15 feet west of No. 2, and is 25 feet deep. The reef or lode is pretty well defined, and is about 3 feet wide with, near the surface, a 1-foot vein of quartz containing good tin ore lying on the foot-wall. In the bottom the ore is chloritic. The lode trends east and west and underlies at 75 degrees to the south.

North-west of No. 2 shaft, on the north side of the dyke, which is quarried in the gully, a hole is sunk on red ferruginous chlorite ore.

In a cutting near the north-east edge of the claim is a quartz reef about 1 foot wide, with fair tin ore. It runs east and west, and underlies to the south.

A vertical fissure, running north-north-west and south-south-east, cuts across the lode and penetrates the country. On its east side at the surface are about 10 feet of red ferruginous chlorite ore. About 14 tons grassed from this cutting might yield 15 per cent. of tin ore.

On the south boundary is a 2-feet-6-inch vein of highly silicated elvan passing into quartzite, and containing fair grey tin ore. About a ton has been taken out. The vein runs west-north-west, and has a slight underlie to south-south-west.

## PERSEVERANCE.

*Fitzgerald and Smyth.*

The Perseverance lies south-east of the Maori Chief, on the western fall of the same hill. A shaft 50 feet deep has been sunk on a quartz reef with an underlie of 70 degrees to the south. About 18 feet to the north, but separated by a belt of porphyry country, is an open cutting on a large quartz reef, with tin ore lying below an east and west diorite dyke 6 feet wide. The dyke underlies at 60 degrees to the south. Tin ore is visible in the quartz above the dyke, and tin and wolfram are interspersed with the quartz underlying the dyke.

About 8 tons are grassed from 20 feet down in the shaft—quartz with a little tin ore, unequal in quality, perhaps averaging 10 per cent. of tin ore. A small quantity of stone is also lying from the open cutting—quartz and tin ore, perhaps 8 per cent. of the latter; also, about 9 tons of quartz and tin ore, with a good deal of wolfram.

About two chains to the west-south-west of the 50-feet shaft is another shaft as well as an open cutting. The latter shows a 3-feet dyke of red ferruginous chlorite (without tin) running east-north-east and underlying slightly to south-south-east on the top of a blue diorite partly altered to viridite.

The shaft—a little to the west of the cutting—is about 25 feet deep. It is sunk in large but straggling veins of quartz and red chlorite, both impregnated with tin. The veins seem to underlie to the north-east and east, and to be leaders connected with the dyke seen in the cutting. One hundred and twenty-five tons of ore from this shaft are said to have been sold to the Herberton Tin Company; it is said to have averaged 118 lbs. to the bag; such a high specific gravity argues a large proportion of tin. About 6 tons have been raised from the shaft since my first visit. Tin ore is seen very freely in the bottom.

A large open cutting, about one chain north-west of this shaft, follows down for about 18 feet to the north-east a vein of quartz with tin in a great diorite dyke.

Some stone (about 4 tons) has been carted from this cutting. Mr. Moffat bought it for £16 per ton. The general direction of the dyke appears to be east-south-east, but this is not yet certain.

If the Big Ben, Maori Chief, and Perseverance were united in a single lease, I should think that exploring the diorite dykes by sinking a shaft through the east-north-east end of the level in the Maori Chief, and driving along the course of the diorite through the elvan dyke, and on the course of the diorite to the Big Ben shaft, would be the plan most likely to effect the best and richest return.

From the form of the ground the workings could be opened to the side of the hill at almost any level by an adit which would unwater the mine, and at the same time greatly facilitate the output of ore and waste.

ST.

## ST. MUNGO.

*Napier and another.*

A shaft has been sunk here to the depth of 60 feet on a dyke of fine-grained, dark-blue, partially altered diorite with steatite veins. The dyke runs west 30 degrees south, and what is taken for the foot-wall—a distinct enough joint-plane—underlies to south 30 degrees east. At the 40-foot level there lies on this foot-wall a mass of the dyke impregnated with iron pyrites and tin ore. So far as I could see, the edges of the dyke—the only true walls in the case—had never been touched in the workings. There said to be fair ore at the bottom of the shaft, but a staging at the 40-foot level prevented my visiting the place.

About 6 tons of stone have been crushed by the Herberton Tin Company. About half-a-ton fair stone—say 15 per cent. of “black ore”—was lying at grass, with about 5 tons of “seconds” containing little except specks of iron pyrites. I should recommend some prospecting by cross-cutting to south 30 degrees east and north 30 degrees west towards the walls of the dyke, to be discontinued in every case wherever the porphyry country is reached.

## WESTERN DISTRICT.\*

## WYATT CLAIM.

*Wyatt and Connolly.*

This occurs near the head of Jamie's Creek. The deposit is best seen in a vertical cutting on the right or north bank of the creek. The cutting shows a series of greywackes and shales, dipping at a low angle to the south-west. The greywackes are somewhat impregnated with green carbonate of copper, and a thickness of about 4 feet of shales has been pretty nearly changed to green and blue carbonate of copper. A little way up the hill is a shaft 25 feet deep, which reaches to the same level as the bottom of the vertical cutting, but is not connected with it. From the bottom of this shaft, although it is only a few feet into the hill, massive copper pyrites were obtained. About 6 tons of copper pyrites, coated with “blue vitriol,” are lying at grass, besides about 22 tons of red and green “seconds” (mixed tile-ore and green and blue carbonate of copper)—say 30 per cent. ore.

## SHAUGHRAUN.

*Keenan and Denny.*

This claim adjoins the Wyatt on the south-east, further up the creek. The copper ore occurs among the bedding-planes of hard, fine-grained quartzose greywackes and mica shales, which dip to the south-west at 15 degrees. There is said to be tin ore among the copper ores, but it is not easily seen and can hardly be worth saving. The ore is mainly tile ore, iron ochre, and red and blue carbonates of copper, with some lumps of pretty pure red oxide of copper.

About 8 tons of first-class ore, containing, say, 10 per cent. of copper and 10 tons of “seconds,” say 7 per cent., are lying at the surface.

## SHAUGHRAUN NO. 1 SOUTH.

*Keenan and Douglas.*

This claim adjoins the Shaughraun to the south-east, further up the creek. A tunnel has been driven for 100 feet to the north-east, among blue greywackes, with the intention of catching the North Australian lode. It is doubtful, however, whether this lode intersects the ground at all. A vertical shaft of the same depth would be more likely to strike an ore deposit, as the example of the adjoining Wyatt and Shaughraun claims leads to the conclusion that the copper ores lie in the bedding-planes of the greywackes and shales—in other words, are to be sought for by vertical rather than by horizontal cross-cutting.

## NORTH AUSTRALIAN.

*O'Loan and Casey.*

This mine has proved hitherto a very valuable property, having yielded a large amount of ore in return for the simplest possible work.

When first discovered the “blow” or outcrop stood several feet above the ground. It has been worked down to the depth of 24 feet in an open cast 10 to 20 feet wide, and extending about 50 feet north-north-west and south-south-east. The country is greywacke and shale, with a dip at 35 degrees to the south-west.

The tin ore occurs in “heads” or joints at right angles to the dip of the stratified rock. The ore has a distinct character of its own. It is fine-grained, grey, and friable, but occasionally finely crystalline on faces. The grey colour results from the presence of steatite in the interstices between particles of the ore. A few blocks of pure ore lying at the surface weigh some hundredweights each. About 600 tons of ore came out of this cutting. A sixth of that quantity was “bagging ore.” The remainder is still lying at the mine. Seventy tons of it should yield nearly 60 per cent. of “black ore.” About twice as much may give 35 per cent., and the rest 30 per cent.

GOOD

\* See Map No. 2.

## GOOD FRIDAY.

*Denny, Watson, and Doherty.*

This claim is mainly on the south side of Jimmy's Creek. The lode is well defined, and runs north 40 degrees west, underlying to east 40 degrees north at 70 degrees. It occurs in hard greywacke and jasperised clay-shale country. It is worked open-cast for about 100 feet. At the south-east end of the cutting is a vertical shaft which strikes the lode at the depth of 40 feet and follows the shoot of the ore for about 30 feet to the south-east.

This shoot of tin ore, whose section averaged 8 feet square, underlay at 45 degrees to the south-east, till, at a shaft 60 feet from the north-west end of the cutting, it was about 30 feet deep. At the shaft it was somewhat deflected, and extended horizontally to the 40 feet shaft above referred to. Crystals of tin ore are common in the foot-wall of the lode.

About 200 tons of good ore have been taken from the Good Friday. The ore has a peculiar appearance. There are large blocks of massive, pure ore, sometimes consisting of aggregates of minute crystals, and associated with brecciform masses of steatite and noble serpentine. In spite of minor differences, however, the ore bears a greater resemblance to that in the North Australian than to any other deposit on the field. It is more than likely that the Good Friday is continuous with the North Australian.

## GOOD FRIDAY, No. 1 SOUTH.

Here, on the left bank of the gully which runs northward through the eastern portion of the Good Friday, a tunnel has been driven to the west for 40 feet, through greywacke country, without having struck any deposit of ore.

## GRAND SECRET.

*W. Harvey.*

On the opposite side of the gully from the Good Friday, No. 1, a tunnel has been driven 115 feet to the east. The inner end of the tunnel has been opened to the surface by a vertical shaft 42 feet deep. The shaft is continued 5 feet below the level of the tunnel. Tin ore continued all the way down the shaft, on a foot-wall which underlay to the north-east. At the bottom the ore is seen, sometimes in lumps of considerable purity, only mixed with a little quartz. Oftener the ore occurs loose in a soft ferruginous rock. No explosives were used in sinking the shaft.

About 70 tons of ore, say 20 per cent., have been raised; fine tin crystals in a soft ferruginous matrix, and intermixed with quartz crystals. Some 8 tons were bagged direct to Sydney.

The tunnel is crossed by a 6-inch dyke of soft elvan, decomposing to kaolin, and sparingly containing fine tin crystals. The greywacke in the neighbourhood of the elvan contains also a little tin ore.

## IRONCLAD.

*Denny, Watson, and Doherty.*

This claim adjoins the North Australian to the north-east, but differs widely from it in its characteristics. It extends about 11 chains north-westward and 5 chains north-eastward.

Near the southern corner of the claim is the "copper shaft." It is 30 feet deep and is sunk on a deposit of carbonate of copper and ochres, which runs mainly east and west, and underlies to the south. The country is alternating shale and greywacke. In the latter the deposit is contracted, and in the former wide and diffuse. About 70 feet up the hill (to the north) another lode is seen. Its cap was red gossan and green carbonate of copper. The lode has been followed in labyrinthine open-cast and other workings till it communicates with the bottom of the "copper shaft." Shortly below the cap the copper ore begins to be intimately and extensively mixed with tin ore in small grains. From the upper levels in the open cutting about 5 tons of stone were taken, which realised £55 in Sydney. Some 10 tons of similar stone remain at grass. It is granular tin ore, with a small proportion of tile ore (ferruginous red oxide of copper) and ochre, and a little green and blue carbonate of copper. About 400 tons of tin ore are grassed from the lower levels. From this heap about 40 tons of copper carbonates have been picked.

The tin-ore contents I should judge to average 25 per cent. An assay by Mr. Denny gives also 10 ounces of silver to the ton. Nearly opposite the northern corner-peg of the North Australian a tunnel has been driven for about 150 feet to east 30 degrees north, into the hill, without cutting anything but the greywacke country.

Near the north-west end of the claim a 3-feet vein of copper carbonates is seen on the right bank of a gully. This is probably the same lode as that which at the other end carries tin and copper ore.

At the very end of the claim is seen, on the north side of the Herberton road, the outcrop of a strong lode of copper carbonate, underlying to south 40 degrees east at 30 degrees.

## CRUCIBLE.

*Denny, Watson, and Doherty.*

A shaft has been sunk 40 feet deep on the left bank of the gully which intersects the claim. The lode runs north 30 degrees west to south 30 degrees east.

The cap contains tin ore, but immediately beneath the surface the tin ore is mixed with carbonate of copper and copper pyrites. At 20 feet a level was driven to south 30 degrees east for 40 feet, and tin ore continued all the way. Below the level the mass of the ore was copper pyrites. About 60 tons of tin ore and 100 tons of copper-ore (including pyrites) have been raised from this shaft. None has yet been crushed.

Ten tons of "bagging ore," sent to Sydney, yielded 58 per cent. of "black ore." A parcel of about 1 ton of the tin ore at grass may yield as much as 60 per cent. of "black ore." Another parcel of 18 tons may average 25 per cent.

On the opposite side of the gully a tunnel strikes and follows irregularly to the west a belt of greywacke and shale country, impregnated with copper oxides and carbonates, along and adjacent to the bedding-planes. About 10 tons of copper ore have been taken from this tunnel.

A shaft has been sunk 60 feet deep higher up the right bank of the same gully. The cap is red gossan and copper carbonate. About 800 tons of ore are lying at grass—copper and iron oxides and green and blue carbonates. Some of it showed, on assay, 13 per cent. of tin ore, although very little is visible. It must be present in very fine grains.

At 30 feet a level has been driven 20 feet to east-south-east and 60 feet to west-north-west, which appears to be the direction of the lode, or rather cupriferous zone.

In the west-north-west level the copper ore keeps pretty nearly in the bedding-planes, but near the end it appears to occur as a true lode running west and underlying very slightly north. The level to east-south-east contains much iron peroxide and not much copper ore. The cupreous zone or lode appears to be 30 feet or more in width. A stage was erected at the 30-feet level, so that I could not see the remainder of the shaft.

In a 40-feet shaft near the north corner of the claim is a little tin ore among copper and iron ochre. About 3 tons have been raised. The underlie appears to be to the east, but this is uncertain.

A little to the west is an underlie shaft sunk 42 feet deep. The brittle greywacke and shale country on the top of a decomposing elvan dyke (which runs north-west and underlies at 70 degrees to south-west) is impregnated with tin ore. About 70 tons have been raised, which may yield 20 per cent. of "black ore."

The Crucible, Good Friday, Shaughraun, Ironclad, and Union (an untried block between the Ironclad and Good Friday) are in course of being amalgamated in a single company, which proposes to work the mines on an extensive scale.

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#### ULSTER.

*McLeod, Morris, and Loudon Brothers.*

This is a north and south dyke of chlorite (altered diorite) with parts decomposed and disguised by peroxide of iron. The dyke has a slight underlie to the east. At 30 feet a short level has been driven north and south. To the south the lode pinches out. The remainder of the shaft is inaccessible.

A tunnel has just been commenced on the level of the gully to the west. It is designed to cut the dyke at a low level. The country at the mouth of the tunnel is very hard massive greywacke.

A stack of stone at grass (about 7 tons), mixed with quartz and tin, with occasional lumps of green and red chlorite, may average 20 per cent. of "black ore." A heap of chlorite ore, amounting to 19 tons, chiefly from the surface, may yield 5 per cent. of "black ore." Some stone from the bottom of the shaft is arsenical iron pyrites mixed with tin ore.

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#### COME-BY-CHANCE.

*Shepherd.*

The only regular deposit of ore is one of about 15 inches wide, extending west-north-west, and underlying at 80 degrees to the north-north-east. A shaft has been sunk on this about 15 feet deep. Elsewhere the tin ore occurs with the utmost irregularity anywhere among the country, which is much altered greywacke copiously veined with steatite, and graduating on the one hand into serpentine and on the other into quartzite. The junction of the stratified rocks with the porphyry must occur close to the southern boundary of the claim. About 250 tons of stone are stacked here, very unequal in quality, perhaps averaging 15 per cent. of tin ore.

The mines above described are all in a country of greywacke and shale, a belt of which runs east and west between the granite country of the Walsh and the porphyry range which divides the waters of that river from those of the Wild River. In the granite country proper not a single mine has been opened. The porphyry range is an almost continuous belt of tin-mines, comprising some of the richest in the field. The intervening greywacke country is remarkable for containing copper ores associated with the tin ores.

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#### LEINSTER. (Registered.)

*Murphy.*

This claim lies in a depression of the crown of the range, and a little on the southern or Wild River fall. The workings are in a red iron-masked chlorite rock which underlies down the hill (to south-south-east) and in the porphyry country, which is also reddened with iron oxides and somewhat impregnated with tin ore.

A tunnel has been started in porphyry country, and after being carried 50 feet into the hill, stops in dark altered diorite.

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#### GLENCAIRN.

*Templeton.*

The Glencairn lies a little to the north-west of the Leinster, and on the Walsh side of the range. There are two distinct deposits of tin ore in the ground. The first, which may be called the top working, is exposed in a cutting, and consists of a large east and west diorite dyke altered to chlorite and serpentine, and sometimes containing large quartz blebs. The dyke is nearly vertical, but has a slight

slight underlie to the south. The country is porphyry. There are grassed from this working about 30 tons mixed porphyry and tin-ore and mixed diorite and tin ore. The tin ore may amount to one-fourth of the bulk of the whole. About 4 tons of very good stone, of which the half (in bulk) may be "black tin" and the other half felspar, 100 tons red and purple "chlorite ore" (iron and manganese masked)—say averaging 25 per cent., although individual pieces are much richer, and about 50 tons of red "chlorite ore," with tin freely disseminated, perhaps to the extent of 20 per cent. on an average, but very unequally. The lower (the newer) working is on a diorite dyke, which underlies about 45 degrees to south-east. The dyke has been followed on the underlie for 40 feet. The upper portion of the dyke is partly impregnated with pyrites, and the water which drips through the roof deposits sulphate of copper from its solution.

From this shaft about 40 tons of stone are grassed—altered quartzose diorite with serpentine and steatite joints—say one-fifth of it tin ore. Some of the stone is a porphyry of felspar and tin ore. About 60 tons more are very much of similar quality as far as tin contents are concerned, but the hornblende matrix of the diorite is in large measure replaced by tin ore. The stone contains some fluor spar and iron pyrites and a little wolfram. There are, lastly, about 40 tons of stone—altered diorite with tin ore in varying proportions, say 15 per cent.

A very large elvan dyke runs south-south-east up the hill west of the shaft, and a smaller one runs east-north-east to the south of the upper working.

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### PRIDE OF THE WEST.

*Brown and Brandon.*

This is a dyke, or perhaps rather an irregularly-shaped boss of intrusive diorite, altered to chlorite, which is often ferruginous. The mass is at least 25 feet wide, and has an underlie at 80 degrees to the north, its general trend being east and west. It is worked by a large open cast and a shaft on the bottom of the open cutting 25 feet deep. At the lower levels the ferruginous chlorite becomes blue-grey fibrous serpentine, and is often heavy with tin ore.

Higher up the hill-side are numerous veins of fibrous serpentine in porphyry. The serpentine has been much compressed, and has a quasi-schistose structure.

About 300 tons of stone are stacked. Their tin contents vary from 0 to 30 per cent. In the stone from the upper levels the iron is peroxidised, while in that from the lower levels it is in the form of protoxide.

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### ST. PATRICK'S DAY.

*Keely, Denny, Philp, and Western Tin Company.*

This dyke extends west 12 degrees south. It has an underlie of 75 degrees to north 12 degrees west. It is worked by an open cutting, of which *Fig. 11* is a sketch.

At the bottom of the shaft the tin ore is coming away from the foot-wall. The whole deposit, as seen in the shaft, is highly ferruginous, but the chlorite of the surface levels seems to assume below the character of a diorite dyke with large quartz blebs, and the hornblende matrix becomes altered towards chlorite and much stained with iron. The best ore occurs in bunches pretty free from iron.

There are 350 to 400 tons of ore stacked. They should average one-third (in bulk) of "black ore." The stone is like that of the Great Western Prospecting Claim, but rather more solid. The pure ore is spotted (like mica in a granite) among felspar, sometimes with quartz.

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### PARNELL.

*Malone and Christy.*

The present owners have just commenced work near the south-west corner of their ground, on a vertical joint running north and south. On its west side is some tin ore underlying in floors down the hill (to the south). In the opposite corner are some old open-cast workings in much jointed and iron-stained porphyry, with joints and quartz veins both running north and south. The quartz contains a little tin.

About 7 or 8 tons of quartz and tin ore with a little wolfram are grassed. The tin ore may amount to 15 per cent. of the whole.

A tunnel has been driven for 28 feet to south 10 degrees east on a large "blow" of chlorite, mostly red with iron peroxide, and containing a little tin ore throughout.

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### HERBERTINA.

*Morris, Murphy, Burton, and Donovan.*

Here a shaft has been sunk 43 feet deep in rather fine-grained porphyry on a joint which carried tin ore for about 12 feet down. About 5 tons of rubbly surface stone are stacked, containing about 8 per cent. of tin ore. A large iron-masked felsitic dyke is visible on the surface immediately to the west of the shaft.

In the lower end of the ground is an open cutting 50 feet long and with a face of 30 feet at its inner end.

The country is porphyry. At the end of the cutting is a wide deposit of greenish chlorite with quartz blebs, and a trace of tin ore. It contains also a little bismuth. About 50 tons of green and reddish chlorite are lying at the mouth of the tunnel. It may contain on an average 2 per cent. of tin ore, for the most part visible only on steatite-coated joints.

TRY

## TRY AGAIN AND CHANCE. (Amalgamated.)

*Denny and others.*

In the middle of the ground to the west of the St. Patrick's Day Claim, and south of the gully, a shaft has been sunk to the depth of 88 feet.

On descending this I found for the last 30 feet a perpendicular joint trending north-north-east. Against this there abuts a joint running west-north-west and underlying at 70 degrees to north-north-east. This latter was followed on the bottom level for 18 feet, and tin ore was found underlying it all the way.

At 18 feet the tin ore shot to south-south-east, and was followed by a drive in that direction for 12 feet. It occurred mainly in joints and heads. Near the surface a brecciated gangue in seen in the shaft, and about half-a-ton of arsenical pyrites and copper pyrites, coated with sulphate and green carbonate of copper, has been raised from this place. The stone now being raised from the bottom is a fine-grained bluish-black chlorite with small and sparse quartz blebs and very fine-grained tin-ore interspersed. About one ton had been raised previous to my visit—about 10 per cent. of ore. About 19 tons of similar stone are lying at grass. About a ton of stone from the shaft at 40 feet is also banked. It is dark-blue chlorite with a good deal of pyrites and say 3 per cent. of tin ore.

From an old shaft on the edge of the gully, a little to the north-north-east, about a ton and a-half of stone similar in character to that taken from the bottom of the deep shaft, but probably averaging better—say 15 per cent. of tin ore—has been grassed, as well as a heap of "seconds," 82 tons, say 3 per cent. This shaft was 44 feet deep, and there was ore left in the bottom. The shaft was full of water.

Up the hill from the present main shaft is a short tunnel with a 40-foot shaft sunk at the inner end on something not now accessible for water, running south-south-west and dipping east-south-east. The tunnel traverses porphyry country. Ferruginous chlorite is seen at the mouth of the shaft. There is a heap of stone at grass—chiefly iron ochre, with a small proportion (say 5 per cent.) of finely crystalline tin ore. It amounts to about 21 tons.

There is also about a ton of iron pyrites, marcasite and copper pyrites with a coating of copper sulphate, and 19 tons mixed green and red chlorite ore with tin in crystals and finely disseminated, amounting to, say, 5 per cent.

Near the north end of the ground is a shaft 38 feet deep on a dyke of quartzose chlorite 12 feet wide. The dyke is well seen in the open cutting at the mouth of the shaft and runs to north-north-east. At the depth of 10 feet some carbonates and lumps of red oxide of copper are seen. About 26 tons of stone are grassed. One ton is of diorite mixed with quartz and tin ore, the latter amounting, perhaps, to 20 per cent. of the whole. The remaining 25 tons are of chlorite masked with iron oxide and containing, perhaps, 7 per cent. of tin ore.

In the north-west corner of the ground is a shaft 48 feet deep. At the bottom the shaft cut the top of a dyke (running north 15 degrees west and underlying to east 15 degrees north) of soft decomposing diorite with green treacherous steatite joints.

On the top of the dyke is a ferruginous gangue with a little quartz and tin ore, and a good deal of wolfram. About 4 tons of red and yellow iron ochres, with a good deal of tin ore throughout, have been stacked from the surface levels. Some 10 tons have come from the lower level. The tin ore, which may amount to 10 per cent., is mixed with quartz and a zeolite.

## DAY DAWN.

*Sullivan.*

This claim adjoins the Try Again and Chance Amalgamated, on the southern boundary. A cutting to the south exposes 4 feet of ferruginous chlorite extending north-east to south-west and underlying slightly to the south-east. It is traversed by clayey joints. Tin ore occurs in the floor on the south-east side. It is nodular and iron stained. About 3 tons of this nodular stone are stacked, containing over 50 per cent. of tin ore. Six tons of similar stone are said to have been sent to Sydney lately. There is also about a ton of small rubble with, say, 30 per cent. of tin ore. A heap of 18 tons of greenish chlorite ore may average 5 per cent. The owner estimates it at 20 per cent.

There are also 4 bags of "specimens" gathered from the surface—nearly pure tin ore. To the east, on the crown of the ridge, a number of trenches and other prospecting works show red "chlorite," sometimes with visible tin ore. The chlorite masses seem to be porphyry locally metamorphosed.

## ST. KILDA. (Registered.)

The principal working is a shaft on the crown of the ridge. It looks like 35 feet deep, but I could see nothing in it as it was logged-up and had some feet of water in the bottom. About 2 tons of quartz and tin ore, containing about 40 per cent. of the latter, and 20 tons of "seconds" with about 5 per cent. of tin ore, are stacked.

A large elvan dyke, well charged with decomposed arsenical pyrites, runs west-south-west to east-north-east by the south side of the shaft.

About 100 feet south-east of the shaft, on the Herbert fall of the hill, a little loose quartz occurs on the surface, and from amongst it there has been gathered about a hundredweight of very good tin ore.

A wide open sinking on the quartz goes through porphyry only. The porphyry has a joint system underlying to the east.

It may reasonably be presumed that the loose quartz came from a vein parallel to the joints in the porphyry and to the east of the cutting—in fact, the whole of the cutting is probably below the vein which was the source of the tin, and so much labour lost.

VICTORIA

## VICTORIA.

This claim lies mainly on the crown of a spur of the range running south from the St. Kilda. It has been prospected in a number of places, and some north and south quartz reefs have been exposed which have yielded about 25 tons of quartzose-stone, containing perhaps 5 per cent. of tin ore and a large proportion of decomposed arsenical pyrites and some wolfram.

## ARGYLL.

*Stewart and Cameron.*

This claim lies south of the Victoria, and is mined in two shafts 50 feet and 80 feet deep. A white decomposed felspathic rock, containing tin ore and native copper, and in the upper levels carbonate of copper, runs west-north-west, with a very slight underlie to north-north-east. About 60 tons of stone have been raised, which might yield 5 per cent. of tin ore.

Up the hill above the shaft is an east and west reef of quartz, which occurs in large blocks. The quartz contains large isolated spots of tin ore, pseudomorphous after wolfram, of which latter there is a great deal.

The original owner of the claim was speared by natives at the neighbouring Chinese gardens.

## KING OF THE NORTH.

This important claim lies on the crown of the German's Spur, which runs north from the range to the west of Denny's Spur.

A shaft has been sunk 100 feet vertically. At the bottom a drive of 30 feet to the north-north-east to the lode and for 10 feet beyond it is all in hard blue diorite. The lode is followed in a drive to west 30 degrees north for about 14 feet, and has a slight underlie towards the shaft. It is a somewhat brecciated portion of the diorite in the neighbourhood of a joint, and contains a good deal of pyrites. Floors of tin ore appear to underlie towards the hill. One hundred and eighty-three tons of stone yielded 45 tons of "black ore" at the Western Company's machine; 26 tons crushed for 15 tons of "black ore" at the Herberton Tin Company's machine. At present there lie on the ground about 84 tons of 40 per cent. stone.

Down the hill a tunnel has been driven to the south-south-east to catch the bottom of the deep shaft. It is at present 110 feet in. At its mouth is a hard blue diorite impregnated with arsenical and copper pyrites underlying at 15 degrees to the south-south-east. The remainder of the tunnel is in porphyry country.

## EXCELSIOR AND WATSON'S FOLLY. (Amalgamated.)

*Watson, Jack, and Young.*

In the Excelsior a shaft has been sunk in an east and west vertical joint in porphyry, and about 6 tons of quartz and tin ore (about 10 per cent. of the latter) have been raised. A tunnel at a lower level, now about 200 feet in, makes towards the deep shaft in the King of the North. It traverses hard blue diorite all the way, passing a little to the right of the Excelsior shaft. The tin ore occurs in Watson's Folly in hard bluish quartz.

## ANNA PARNELL.

This claim lies on the top of the range west of the St. Kilda.

A tunnel has been driven from the Walsh (north) side of the range for 50 feet to the south-west, through porphyry country. Its inner end strikes a quartz reef which runs south-west and underlies at 45 degrees to the south-east. Ore is worked up to the surface (15 feet). At the level of the tunnel the quartz reef has met with a cross course underlying to the west. The latter has been followed down for about 15 feet. About 20 tons of quartz and tin ore—say 15 per cent. of the latter—have been stacked.

## T. OLAIM, No. 1 EAST

Lies to the north of the Anna Parnell and west of the Excelsior. The principal deposit of ore occurs in a joint running north-west and underlying to the north-east at 60 degrees in a large dyke of coarse-grained granite. The foot-wall of this joint has been pierced, and other joints followed in every direction. One joint has a good deal of copper pyrites, from which the water is extracting and depositing sulphate of copper in the form of stalactites. One joint underlying to south-south-east shows a great deal of copper and iron pyrites, with sulphate of copper in course of formation. The best of the tin ore was taken from this. The general course of the dyke is west-north-west. The ore raised may be classed as follows:—

- (1.) 11 tons of quartz and green chlorite with about 15 per cent. of tin ore.
- (2.) 12 tons diorite with about 15 per cent. of tin ore and rather more of quartz.
- (3.) 75 tons of blue diorite with quartz and tin ore; the latter sometimes replacing the rock entirely. Estimated tin ore contents 35 per cent.

## BOULTON'S FOLLY.

*Boulton and Bernheim.*

A dyke 6 inches to 3 feet wide traverses from north-east to south-west the whole length of the ground, with a slight underlie to south-east. It has apparently been a diorite, but is now completely altered to a soft green chlorite. It is sometimes ferruginous and has very good ore in places.

In

In the upper end of the claim the chlorite appears to be replaced by a large quartz "blow." Some of the specimens from the surface, especially weathered ones, are very pure. There are 3 or 4 tons of 40 per cent. stone at grass, and a great deal of chloritic rock, containing a small proportion of fine tin, has been stacked. The green chlorite contains numerous fine garnets.

#### DREADNOUGHT.

*Stewart, Hansen, and Thomas.*

A shaft has been sunk 60 feet on a very irregular deposit of ferruginous breccia, which underlies to the south-east at 45 degrees. It is apparently a lode, but it is not easy to distinguish either top or bottom, owing to the partial decomposition of the adjacent porphyry country and its impregnation with iron peroxide. The tin ore persisted pretty well all the way down in the shaft in a shoot which was 6 or 7 feet wide near the bottom level and underlay to the south-west. Three heaps of stone have been stacked:—

- (1.) 9 tons tin ore (say 25 per cent.) after granular, and with the outside of the masses crystalline, in a matrix of weathered felspar. Occasional masses of wolfram, and sometimes tin pseudomorphous after wolfram.
- (2.) 33 tons similar, but more weathered and more ferruginous. (Say 15 per cent. tin ore.)
- (3.) 160 tons similar. Rubbly. A good deal of wolfram. Occasional quartz. (Say 20 per cent. of tin ore.)

#### STEWART'S T. CLAIM.

*Stewart, and Western Tin Company.*

This claim lies west of the No. 1 East. A shaft 65 feet deep has been sunk near the southern boundary of the ground, on a north-west and south-east quartz reef which underlies slightly to the south-west. At the bottom of the shaft the quartz continues as a narrow shoot, but for the last 12 feet contains no tin ore, although it is still accompanied by wolfram and pyrites. A sort of "foot-wall" with a serpentinous face continues all the way down. At the bottom a "hanging-wall" of dark diorite is seen—probably a dyke with which the quartz reef is connected.

A heap of stone amounting to about 43 tons, and containing about 15 per cent. of tin ore, is lying at grass.

In the north-west corner of the ground is a shaft 50 feet deep on a ferruginous and chloritic joint which underlies to the south-west.

The shaft is sunk through the joint, which has tin ore on the under side. About 40 tons of 15 per cent. ore have been raised from here.

In the corner near the Queen of the West is a north-east and south-west lode of arsenical pyrites and red peroxide of iron, with some blue and green carbonate of copper and red copper ore. On the south-east side of the lode is a coarse-grained diorite dyke with large quartz blebs, the quartz containing a little tin ore. A tunnel has been driven to the north-east for 255 feet on the course of the dyke. Tin ore nearly three feet wide is seen in a narrow horizontal floor. Other floors of ore further along the tunnel underlie to the north-east. At 200 feet the tunnel is intersected by a shaft which reaches its bottom level at 70 feet and is continued for 40 feet below. At the surface the lode is about 1 foot in width, and contains good tin ore. Thirty-five feet further along the tunnel a blind shaft has been sunk for 40 feet below the level of the tunnel. At the bottom of the blind shaft the ore is in a vein a few inches to 2 feet thick and 6 feet wide, occurring in coarse-grained diorite, underlying at a high angle to south-south-east.

The vein contains also much copper pyrites and some tin pyrites. Above this shaft the roof of the tunnel has been stoped out to the height of 18 feet. The tin ore is said to have been 7 feet wide in some places.

The tunnel continues about 20 feet beyond the blind shaft, through porphyry country below the pyritous "foot-wall" of the dyke from which the water brings out hair-like crystals of copper sulphate.

One hundred and twelve tons of stone have gone to the Western Company's machine; 88 tons more are stacked, small and brittle. It may yield 30 per cent. of tin ore.

At the mouth of the tunnel are 175 tons of very fine stone, which may average quite 40 per cent. of ore; also 143 tons "seconds," rather quartzose, with, say, 15 per cent. of tin ore.

#### QUEEN OF THE WEST.

*James Pyle and James Boyd.*

The tin ore occurs here porphyritically distributed throughout a decomposed matrix of felspar and a little quartz.

A vertical joint was followed for 40 feet in a shaft, and tin ore continued all the way in its vicinity. The shaft was reached at its bottom level by a tunnel driven 40 feet to the south-south-west. The tunnel is continued for 40 feet beyond the shaft in a south-westerly direction. The joint continues for the whole length of the tunnel. At the inner end it underlies to the south-west.

About 65 tons of the last stone raised are intermixed with tin ore to the extent of one-third in bulk. About 5 tons are rather more mixed with quartz, and may contain about 15 per cent. of ore.

A shaft has been sunk at the mouth of the tunnel on a lode which runs east-south-east, with an underlie to the south-south-west.

About 17 tons of ore have been raised from this shaft. It is often massive, and may average 40 per cent. throughout. The lode was left in the bottom, but rather heavy water came in.

The owners intend to sink the shaft in the tunnel to cut this lode.

#### GREAT WESTERN.

*Western Tin Mining Company.*

This claim was the first discovered on the western field (see my report of 27th October, 1880), and still maintains its position as the most important. It consists of 4 blocks which, having been taken up at different times and for different reasons, now present a singular shape, something like a conical bullet, with its apex pointing west-north-west. A shaft

A shaft has been sunk near the eastern boundary of No. 1 Block on the continuation of the Queen of the West lode. It pinched and was left at 30 feet deep. About 11 tons of stone have been grassed from this shaft. The tin ore amounts to about one-third of the heap. About 8 tons are fine chips, the result of a primitive dollying and washing process.

Just behind the shaft is a great outcrop of frothy iron oxide. Its larger axis apparently extends south-south-eastward across the summit of the hill, but this appearance may be deceptive, and the "gossan" may be the cap of the lode worked in the shaft.

West-south-west of this shaft is another (water in bottom). It has been sunk 30 feet on the underside of a joint which runs east-north-east and underlies north-north-west in gritty porphyry. Forty or 50 tons are grassed from here of 40 per cent. stone, consisting of tin ore occurring porphyritically in a porphyry of silicated felspar and quartz. Five or 6 tons were bagged and sold. Some that is left looks very good and solid.

The next working to the north-west is a very conspicuous feature from the north, whence it appears as a great gash like a railway-cutting across the hill-top. The gash runs from north-east to south-west for 100 feet. It has been excavated along the line of a great slip or fault, which has an underlie to the north-west. A north and south joint (underlying east) abuts against (is cut off by) the north-east slip, and against the underlie side of an east-south-east slip which underlies south-south-west, and is cut off at its west-north-west end by the north-east slip. Enormous quantities of tin ore have been grassed from the three lines. The present working is mainly in an underlie shaft sunk on the east-south-east line. Heavy tin ore can be seen most of the way down. At the bottom a level is carried about 20 feet to east-south-east, and tin ore in a soft matrix of decomposing porphyry and a little quartz is seen on the "foot-wall"—more properly the underside of the slip. From the end of this level a drive has been made for 70 feet to the south-east through a dark-blue diorite with quartz blebs, but no tin ore.

A cross-cut has been driven about 12 feet to the north-east, and another to the south-south-west (with fine tin ore on roof) for 15 feet to a "foot-wall" which dips to the north. A blind shaft is sunk on this underlie (65 degrees) to the depth of 30 feet. At the bottom the "foot-wall" seems to be a dark little-altered quartz bleb diorite. The "formation" appears to lie between this dyke and the porphyry country to the north. About 1,200 tons of good stone are stacked. The bulk of it has about a third, or rather more, of ore mixed up in a felspar matrix, which is often decomposing. Fig. 12, sketched from a specimen in my possession, shows a not uncommon arrangement.

In such cases it would appear that small crystalline aggregates of orthoclase felspar had been developed in a matrix of quartz, and that a portion of the quartz subsequently crystallised around the felspar.

About 100 yards west of the "gash" workings is a shaft 80 feet deep on a slip or joint underlying to south-south-west. The country here is fine-grained porphyry traversed in every direction by joints. About 60 tons of very fine stone are stacked here, containing perhaps 50 per cent., by weight, of tin ore. About as much more may have 30 per cent. A good deal of quartz occurs in the first-class ore, and nodules of quartz are often surrounded by tin ore.

About 100 yards to the north-west of this, and on the other side of the hill, is a small opening from which a few tons of very good ore have been obtained.

Some 80 yards north-north-east of the forge is an open cutting, with a shaft 25 deep on an iron-masked porphyry, with tin ore shooting down to the south-south-east. The ore appears to be cut off by an east and west dyke of blue diorite which is in process of undergoing alteration in the direction of chlorite. About 50 tons of stone from here have been stacked. Half of it might yield 25 per cent. of tin ore; the rest is inferior.

Another shaft, about 50 feet nearer the forge, has been sunk 30 feet deep on a ferruginous gossan with tin ore and quartz. The gossan underlies to the north. About 20 tons of very varying stone are stacked. It may average 15 per cent. of ore.

In block No. 4 a white elvan runs south-west to north-east. A tunnel has been driven from the south-east, beginning in this elvan, which it traverses for the first 40 feet. About 150 feet from the mouth of the tunnel a vein of copper pyrites is cut running east-north-east and underlying at 75 degrees to south-south-east.

A shaft is being sunk here 90 feet deep from the surface to the level of the tunnel.

From the upper levels good massive tin ore is being obtained. About 15 tons of it are stacked, which may yield 30 per cent. of "black ore."

With the exception of the elvan dyke and the vein of copper pyrites, the remainder of the tunnel (230 feet long) is in porphyry country.

Beside the store is a long outcrop of greenish decomposed arsenical pyrites in quartz or quartzite, running west-north-west to east-south-east. This has been worked open-cast for a considerable distance. About 10 tons of, say, 40 per cent. ore are stacked here—large crystals of quartz enveloped in cassiterite. Some ore was bagged from this cutting and sold in the early days of the field.

Near the western boundary is another large quarry, terminating in a tunnel, which is driven about 30 feet on the course of an elvan dyke. The dyke runs north-north-east and underlies to east-south-east.

In the vicinity of the dyke the porphyry is traversed by ferruginous joints and masses of tin ore. A short shaft in the bottom of the cutting, about 30 feet from the mouth of the tunnel, shows rich tin ore going down in a quartz reef parallel to the elvan. About 500 tons of stone from this cutting may yield 30 to 40 per cent. of tin ore. The tin ore is somewhat crystalline, but occurs in large black masses aggregated round quartz and felspar, especially the latter.

The Great Western has a well-appointed machine, which has recently commenced operations about half-a-mile below the Watsonville township. A tramway has been begun to connect the mines with the machine. It will be an expensive work, but will soon repay itself in the saving of haulage.\*

#### No. 1 WEST GREAT WESTERN.

*D. Howell.*

This is a north and south reef of quartz and felspar underlying to the east at a high angle.

A shaft has been sunk 25 feet. Tin ore shows most freely on the edge of the claim adjoining the No. 4 block of the Great Western. About 19 tons of stone are stacked—black masses of somewhat crystalline tin ore among felspar and quartz. There may be 40 per cent. of tin ore in the stone.

#### BOUNDARY

\* Since the above was in print, the tramway has been finished and is now in full operation.

## BOUNDARY.

*Watson and Doherty.*

A shaft 52 feet deep has been sunk on the top of the hill on a slip or joint which underlies to the north-west. The ore at the bottom is very good.

Of the stone stacked about 50 tons may be estimated to average 40 per cent. of "black ore" (gangue, felspar and quartz), 25 tons of a rubbly mixture of tin ore, felspar, and quartz may yield 35 per cent. of the former. Ten tons of stone in which the tin ore is associated with felspar alone may yield 8 per cent. of the former; 10 tons from the surface may go as high as 15 per cent. of tin ore.

South of this shaft a tunnel has been driven 85 feet to the north-east in fine-grained porphyry country. A little up the hill a north-west to south-east lode has been opened up in a small cutting. Some fair ore comes from the bottom, which was, however, covered with water at my visit. The tunnel has nearly reached the line of this lode, but it may probably be cut off by the large elvan dyke seen in the nearest working of the Great Western.

## CALEDONIAN.

This claim lies on both sides of the gully which runs northward from the Boundary claim to the township of Watsonville. Two shafts have been sunk—the eastmost 140 feet deep, and the westmost 30 feet.

The deep shaft follows to the west at 45 degrees the underlie of a dyke or lode. Tin ore is seen in the shaft in several places from near the surface to the 70-foot level. There a quartz reef bearing heavy tin ore on a face 2 or 3 feet wide underlies at 60 degrees to west-north-west.

At 120 feet a very fine-grained, much-jointed decomposed diorite, 3 feet wide, runs north-east to south-west, and fades to the north-west. From this up to the 70-foot level good tin ore is seen almost continuously. Below the 120-foot level the shaft is in porphyry country, and no tin ore has been obtained. From the bottom of the shaft, 140 feet deep, a lode has been followed in a level for 20 feet to north 35 degrees west. It underlies at 65 degrees to west 35 degrees south. The walls of hard fine-grained porphyry are 2 feet apart and enclose a brecciated gangue with talc and marcasite.

If the stanniferous diorite dyke is cut off by the lode, which I believe to be the case, it is to be looked for on the north-east side of the lode at a higher level than 120 feet. Thirteen tons are stacked from the surface. It may average 10 per cent. of "black ore." Another lot of 2 tons may yield 25 per cent.; 60 tons from the lower level may average 30 per cent.; while 10 tons may even yield 50 per cent. A parcel from the westmost shaft, amounting to 30 tons of tin ore and yellow elvan, the compact masses of ore often containing large isolated crystals of quartz, may yield 40 per cent. of tin ore. Five or six tons were bagged and sold from the claims in the early days.

On the right bank of the gully, opposite the deep shaft, is a large open-cast on a dyke of elvan, 1 to 3 feet wide, running east 15 degrees north and underlying at 70 degrees to north 15 degrees west. Tin ore occurs mainly at the contact of the dyke with the porphyry country. The south side of the elvan is somewhat quartzose. Eight tons of stone are paddocked from this cutting. It is tender and rubbly, and apparently contains less than 10 per cent. of "black ore." Twenty tons from the inner end of the tunnel are rather more solid, and the tin ore occurs in more compact masses. The tin ore may amount to 25 per cent. of the whole.

In the southern (uppermost) portion of the ground are some old workings known as the Skeleton—from the fact of a native skeleton having been found there. From an old wall sunk on an elvan dyke, which runs south-south-east, about 7 tons of 40 per cent. stone have been obtained. The stone has apparently come from the hanging-wall (east-north-east side.) From a short tunnel below the Skeleton, on the gully to the east, on a 2-foot elvan dyke running east and west through porphyry country and underlying to the north at 65 degrees, 3 tons of good 30 per cent. stone have been obtained.\*

## MOUNTAINEER.

*McIntyre, Rodney, and Watson.*

A diorite dyke in very hard, fine-grained, porphyry country. The dyke runs north-north-west to south-south-east, and underlies at 80 degrees to west-south-west. The diorite, when fine, contains a notable proportion of tin ore.

The owners are at present raising 50 per cent. stone in the bottom of an open cutting—about 2 hundredweight of it. There are about 10 tons of inferior stone, and a large heap from the surface of very poor stone. Two tons have gone down to be crushed. Iron pyrites occurs freely among the tin ore, with an occasional speck of galena.

## KING OF THE RANGES.

*Gillespie and Scoullar.*

The workings here have been hitherto mainly open-cast, following two slips or lodes, the north-most running north-north-east and underlying to west-north-west, and the southmost running east-north-east and underlying at 65 degrees to north-north-west. On the upper or northern slip a 50-foot shaft has been sunk. A band of quite unaltered slate, striking east and west, is seen at the mouth of the open cast in contact with the porphyry of the country.

A new road has just been led down the spur to take the ore to the machine. As none has yet been removed, a very pretty show of ore is on the ground.

From the lower levels there are about 150 tons of 30 per cent. stone in small chips.

From the surface—quartz and tin—50 tons may yield 15 per cent. of "black ore," and 20 tons of crystalline quartz with tin ore 20 per cent.; 35 tons of very pure ore, either lumps of pure greyish cassiterite or cassiterite mixed porphyritically with decomposed felspar—50 per cent. Five tons culled from this lot are lying in bags; 20 tons of "seconds"—20 per cent.; 8 tons of washdirt goes 12 to 20 lbs. of tin ore to the dish.

South of the main working about 5 tons of splendid "black ore," with a little quartz, were obtained at 15 feet from the surface in a cutting. A drive has been started to cut the deposit where the tin ore was lost, on a very fine-grained, hard, black diorite running east-north-east, and containing arsenical pyrites. Mr. Scoullar was speared by natives while working on this claim. His wound, to the surprise of everybody, did not prove fatal, and he has now recovered.

The adjoining Spear claim belongs to the same owners, who are said to have 100 tons of good ore ready for the machine. The former owner was killed by the natives.

## THOMPSON'S

\* The Company have declared their first dividend of 3d. per share on the 40,000 £1-shares of which the capital consists. The Company have only called up 3s. per share of their capital since starting in November of last year. There are now 100 tons of ore at the Great Western Company's mill awaiting crushing, and 6 tons of bagging ore, averaging 70 per cent., for shipment to London.—Secretary's Report, March, 1883.

## THOMPSON'S CREEK DISTRICT.\*

## TASMANIAN.

*North Australian Mining Company.*

This mine is on a dyke of quartzose diorite, which is clearly traceable on the surface for the whole length of the company's ground (36 chains), with an average width of about 7 feet and an underlie to the west of about 70 degrees. In the dyke, generally in the centre, lies a mass of drusy quartz in which tin ore can be seen for considerable distances where the surface has been bared in prospecting operations. The dyke runs north and south.

The main shaft (No. 1) is 48 feet deep, and in the sinking about 1 ton of tin-bearing stone has been obtained. I estimate the total amount hitherto obtained from the shaft and open-cast workings roughly at 110 tons, containing about 40 per cent of "black ore," together with 160 tons of rubble, which I can well believe gives (as I am informed) 2 lbs. of "black ore" to the dish.

No. 3 shaft is near the southern end of the claim, near a point where the main dyke splits up into four branches. (See sketch plan, *Fig. 12.*) It is sunk on one of the branches running south 10 degrees west. It is only 8 feet deep as yet. It began on a mere spot of ore, which widened gradually out. At the present bottom the ore is 2 feet wide. About 4 tons of fair stone have been raised.

No. 4 working is in the south-east corner of the claim, and is just being opened. It is on a thin vein of quartz in a dyke running north 15 degrees west. This is followed for a short distance up the hill (south), in which direction it is becoming wider, and carries ore an inch or two in width.

About 50 yards south of the claim the branching dykes are cut off by a very wide east and west elvan dyke. The diorite dykes can be picked up again on the other side of the elvan, and are again interrupted by several elvans. Tin ore is visible in the diorite dykes south of the large elvan. The regularity of the Tasmanian dyke is without a parallel on the field. The dyke is of a manageable width.

A capacious dam is in course of erection, and crushing machinery is on the way up from Port Douglas. [20th March, 1883. The machine is now at work.]†

## POMPEII.

The Pompeii lies on the eastern or right bank of Thompson's Creek, opposite the Tasmanian machine. The country is porphyry, and is traversed by a north-west and south-east dyke of quartz diorite. It is 3 feet wide and very distinctly traceable throughout the ground, widening to about 6 feet towards the south-east end. It is penetrated by quartz veins, especially in the middle. It also contains "floors" of tin ore. Towards the south-east end the dyke becomes locally altered to green chlorite with red discolourations, and is in parts heavy with tin ore.

A shaft 20 feet deep has been sunk. Ten tons of surface stone are ready for crushing; it consists of quartz and felspar, with about 35 per cent. of tin ore. There are also about 110 tons of rubble pretty similar in quality.

A strong north-north-east dyke connects the Pompeii with the Vesuvius. It is crossed by vertical veins and threads of quartz.

## VESUVIUS.

This claim lies north-east of the Pompeii. A shaft 45 feet deep has been sunk on a quartz reef running north-north-west to south-south-east and underlying at 70 degrees to west-south-west. The reef is partly discoloured with iron peroxide and has a brecciated gangue underlying it. It underlies a great diorite dyke. About 20 tons of stone have been raised from the shaft.

The ore is never in compact masses, but is fairly well scattered through the quartz and diorite, say to the extent of 15 per cent. of the whole. The dyke is distinctly traceable into the adjoining claim, the No. 1 Vesuvius.

## No. 1 VESUVIUS.

A 50-foot vertical shaft has been sunk on the dyke. A floor of tin ore is seen in the bottom. A quartz reef at least 2 feet wide is seen on the surface near the shaft.

About 15 tons of stone have been raised—a mixture of quartz, diorite, and buff-coloured tin ore. The latter amounts to about 15 per cent.

## CHESTERFIELD.

A north-west and south-east dyke, underlying at 80 degrees to south-west, has been opened in a shaft 15 feet deep. There is water in the bottom, but streaks of tin ore can be seen in quartz in the diorite.

In a shaft 25 feet deep, a few feet to south-east, is a quartz vein underlying at 50 degrees to the north, and containing tin ore at the east end of the shaft. The quartz occurs in diorite, which I believe to be a dyke running north-north-west.

About 20 tons of quartz and diorite stone, containing, say, 25 per cent. of tin ore, have been raised.

## COLOSSUS.

*Gerold and Dudley.*

The Colossus is a quarry opened in a huge reef of quartz, which almost entirely replaces a dyke of quartz diorite. The latter is sometimes altered to viridite. The dyke is 4 to 17 feet wide. It runs north 15 degrees west, with a slight underlie to west 15 degrees south. Tin occurs in the quartz in streaks with a ribboned structure, and is freely seen in the face and bottom of the open workings. It can be traced, moreover, for a considerable distance along the outcrop of the reef, where no work has yet been done.

The

\* See Map, *Fig. 13.*

† A recent crushing of 74 tons yielded 30 tons 10 cwt. 1 qr. 19 lbs., equal to about 40 per cent. The ore was reckoned only second-class, and not estimated to yield more than 34 per cent. From the same mine there are also about 50 tons of dressed tin bagged and being bagged at the Herberton Co-operative Company's battery, and another lot of 300 tons awaits the operation of the stampers at the Bischoff Company's mill at Watsonville. When this latter parcel is finished it is confidently expected the company will have 200 tons of dressed tin for sale.—Newspaper report, 31st March, 1883.

The workings are about a mile and a-half south of the Tasmanian and nearly in the line of the main dyke of that claim.

Something like 50 tons of stone, which I should reckon to contain about 20 per cent. of tin ore, are stacked on the ground, besides a large quantity of "seconds."

Near the head of Thompson's Creek is GIBLETS', an important claim. There are also tin lodes on the neighbouring Emu Creek. Stream and lode tin are found in Halpin's Creek, a stream which falls into the left bank of the Walsh, 32 miles below Thompson's Creek. Stream tin is obtained from Pinnacle Creek, which falls into the Walsh on the same side 10 miles higher, and on Oakey Creek which falls into the opposite bank of the Walsh between Halpin's and Pinnacle Creeks. It is also found on the Tate River, about 30 miles further to the west. My time did not permit of visiting all these places.

To the south the Dry River, Annitt, or Nettle's Creek, Return Creek, and Rudd Creek, tributaries of the Herbert River, have all yielded stream tin. On Return Creek a number of lodes have been opened which are highly spoken of. Stream tin has also been obtained on the tributaries of the Burdekin at Kangaroo Hills and the Star.

From Kangaroo Hills fine specimens of lode tin (very much resembling the Great Western ore) have recently come to town.

A continuous tract of nearly 200 miles in length of stanniferous country has thus been added to the wealth of the colony within the last three years.

One fact unnoticed and unsuspected when I wrote my first report comes out clearly and unmistakably from a detailed examination of the field, now that something more than the mere surface is accessible to observation. That fact is the intimate connection of the tin deposits with metamorphosed igneous dykes. Such dykes, emanating from a deep-seated reservoir of molten matter, forced their way under pressure into fissures in the solid porphyry rock and consolidated as basic igneous rocks. The basic rocks of the dykes seem to have undergone a gradual process of metamorphism. The dykes now consist mainly of quartzose chlorite and occasionally of quartzose serpentine. It may be inferred that they were originally consolidated as quartz diorites or as rocks more or less of the basaltic type. The tin occurs in floors, veins, or pipes among the joint-planes of the dykes.

It is quite possible that the tin may have come up in the first instance molten with the molten mineral matter of the dyke. In that case it is probable that it was afterwards dissolved and re-deposited in the open joint-planes of the dyke. A further separation and redistribution may have taken place simultaneously with the chemical or electric action which resulted in the metamorphism of the dykes.

On the other hand, the tin may have first come up in solution, after the consolidation of the dykes, along the walls of the latter and among the fissures and joint-planes by which they were traversed, and been deposited there. A re-solution of the tin ore would probably take place on the metamorphism of the dykes; and as the metamorphosed dykes had probably a new joint-system developed in them, a further concentration of the ore may have taken place.

In any case there is nothing to favour the supposition that waters containing tin in solution and circulating through the upper portion of the earth's crust failed to deposit tin ore in the porphyry, but deposited it immediately on meeting with the metamorphosed dykes. On the other hand, there are good grounds for supposing that the tin was carried up, either with the dykes in a molten condition or was carried up in solution by mineral waters along the lines of the dykes. In either case the permeation of the adjacent porphyry by the mineral waters may explain the occasional occurrence of tin ore in the "country rock." In either case, as the dykes have originated in a deep-seated mass of molten matter, they may be expected to carry the tin ore to greater depths than are ever likely to be reached by mining. The metamorphosed dykes are traversed by a series of dykes of quartz porphyry, strictly analogous to the elvans of *Cornwall*. They do not, however, appear to be in this field prolific sources of ore. Indeed, the "Three Star" and "Herberton Ironclad" elvans are almost the only known cases of stanniferous elvan. It appears, however, from the cases of the Erin-go-Bragh and Southern Cross that the elvans have occasionally served to re-open the basic dykes and permit of a further local deposition of tin ore.

Deposits of ore of such a nature as have been described are not to be mined on the ordinary principles of quartz-reefing. Hardly a mine on the field does not offer illustrations of errors in judgment committed through regarding all sorts of joints and fissures as hanging-walls or foot-walls. The only walls in such cases are the walls of the dykes, or, to speak in easily understood language, the planes of contact between the blue rock and the porphyry. A systematic method of prospecting by sinking shafts and driving main levels at intervals of, say, 10 fathoms along the course of the dyke, and cross-levels from the main levels to the walls, would be the most economical plan possible in such circumstances.

As there are as yet no smelting works on the field\* the ore has to be packed or carted to the port (Port Douglas 85 miles, or Cairns 50 miles), and then sent to Sydney. The carriage is enormous, and only rich or dressed ores can afford to pay it. When the railway promised by the Government is constructed there can be no reasonable doubt that the field will advance by leaps and bounds. At present there are five machines; two—the Great Northern Company's and the Co-operative—on the Wild River, at Herberton; one—the Monarch Company's—on Nigger Creek; one—the Great Western Company's—on Jamie's Creek, Watsonville; and one—the Herberton-Bischoff Company's—on the Walsh River.

DRY

\* Works are, however, in course of erection.

## TARGET No. 1 WEST.

*Turnbull.*

A tunnel has just been opened on the level of the Dry River, opposite the Newelltown camp, on a quartz reef in slate country. There is no iron gossan. Too little work has yet been done to prove anything.

## TARGET.

This lode is on the hill above the No. 1 West. It runs east 10 degrees south, and underlies to south 10 degrees west at 60 degrees. A 60-foot shaft has been sunk on the underlie. On the surface the lode is about 4 feet wide, with galena and yellow oxide of lead. The galena continues pretty well all the way down the shaft, and there are large quantities of yellow oxide and grey carbonate of lead, all of which will probably become galena below the water level.

## SILVER VALLEY.

This claim lies a little to the south-east of the Target, and on the western fall of the hill. It has a thin vertical vein of galena running south-south-east through slate country. There is no iron gossan—a circumstance which probably indicates that the lode at a depth is likely to be free from any large admixture of pyrites.

## TARGET No. 1 EAST.

Nearly in the line of the Silver Valley, but probably a distinct lode. A gully intervenes. The deposit is a true lode running east 10 degrees south, and underlying south 10 degrees west. A shaft has been sunk 55 feet. There was galena for the first 30 feet associated with quartz. Thence to the bottom was a blank, with only a brecciated gangue. At the bottom galena and grey carbonate of lead again began to make.

## CALEDONIA.

*Pollard, McLean, and Newell.*

This claim lies about three-quarters of a mile west 30 degrees south of the Newelltown camp, in nearly level and easily accessible country.

The country rock is slate, almost vertical. The lode runs west-north-west to east-south-east. At the bottom of the shaft, which is 81 feet deep, the width of the lode is 4 feet, with veins of galena, amounting to about 2 feet in all. It is as promising a lode as one could wish to see. A good deal of galena lies at grass, together with some massive and crystallised carbonate of lead. A great quantity of yellow oxide of lead and some linarite (sulphate of lead and copper) have come from the surface levels. There is little iron gossan.

## JOHN BULL.

*Goertz.*

This lies east of the Caledonia. A few holes have been opened up. In one the sketch (*Fig. 15*) was made.

Some of the blocks of galena are 4 inches thick. There is also some sulphate of copper and lead.

About 50 yards north of the hole above sketched is a north-west lode of galena and yellow oxide of lead underlying to the south-west.

A furlong further north is a shaft on a galena lode running north 30 degrees west.

## WHITE STAR.

*Mulligan and Macrory.*

About a quarter of a mile west of the Caledonia. The lode occurs in very soft country—dark shales and thin greywacke bands. It runs west 30 degrees north, and underlies to south 30 degrees west. Galena is seen on the line of the lode for fully 100 feet on the surface. There is no red gossan. A shaft has been sunk 50 feet. Galena continued for the first 20 feet, and was in one place nearly three feet wide. The next 30 feet was a blank, but galena and quartz are beginning to come in at the bottom.

About 5 tons of galena and a quantity of carbonates and oxides of lead are stacked.

## RAINBOW.

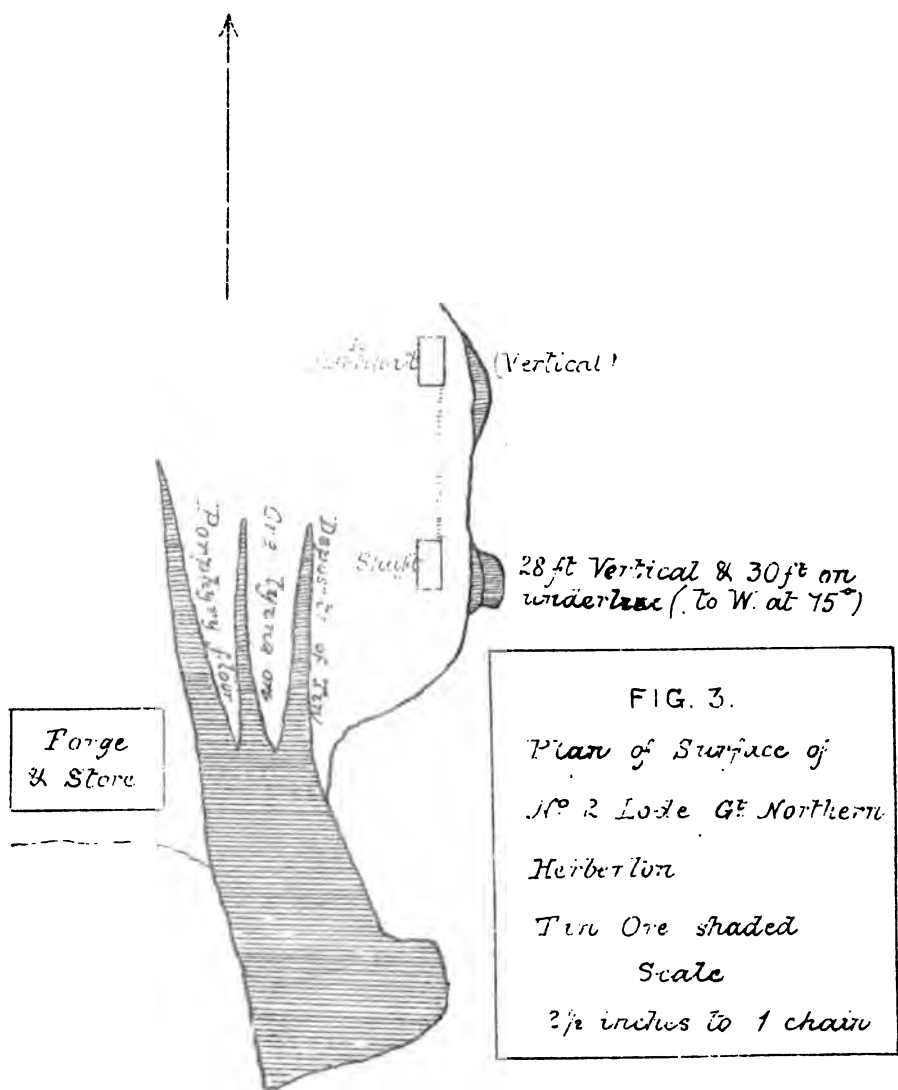
The lode runs north-west and south-east, and has a slight underlie to south-west. It occurs in black slate country, and has every appearance of being a permanent lode.

The width of the lode varies from 2 to 4 feet. In the bottom of the shaft (80 feet deep) I saw a long shoot of very pure galena, 2 feet or more. The mine is capable of yielding a large output, and, under reasonable conditions of carriage, the lead-contents of the ore ought almost to cover all expenses, leaving the silver-contents for profit. The country is easy to work, and the mine is readily accessible for drays, being only about a mile and a-half west-south-west of the Newellton camp. A tramway could be very easily constructed from the camp to the Rainbow, passing through the Silver Streak, John Bull, Caledonia, and White Star mines.

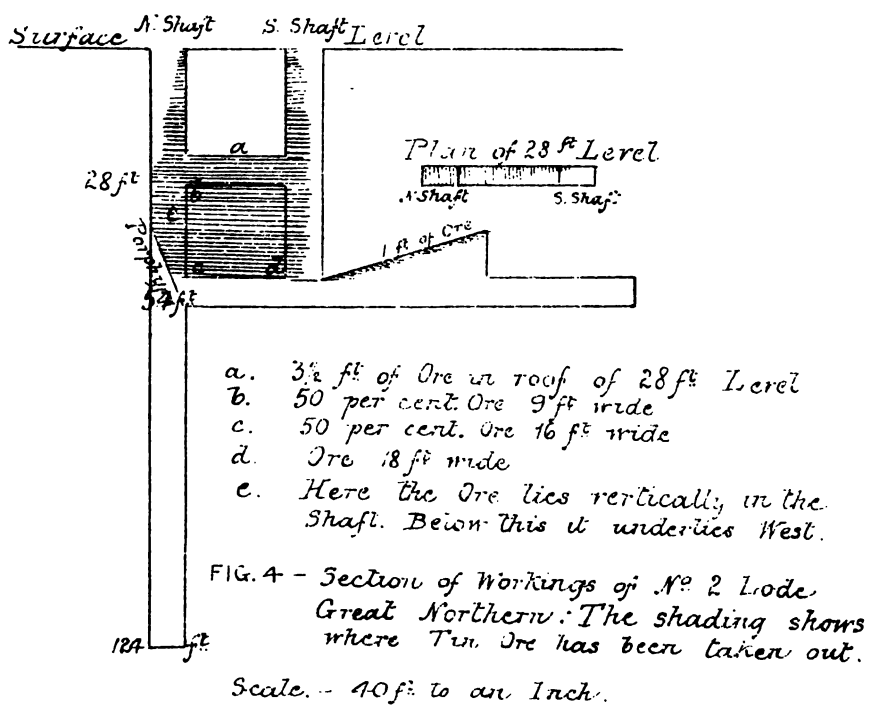
ROBERT L. JACK,  
Government Geologist.

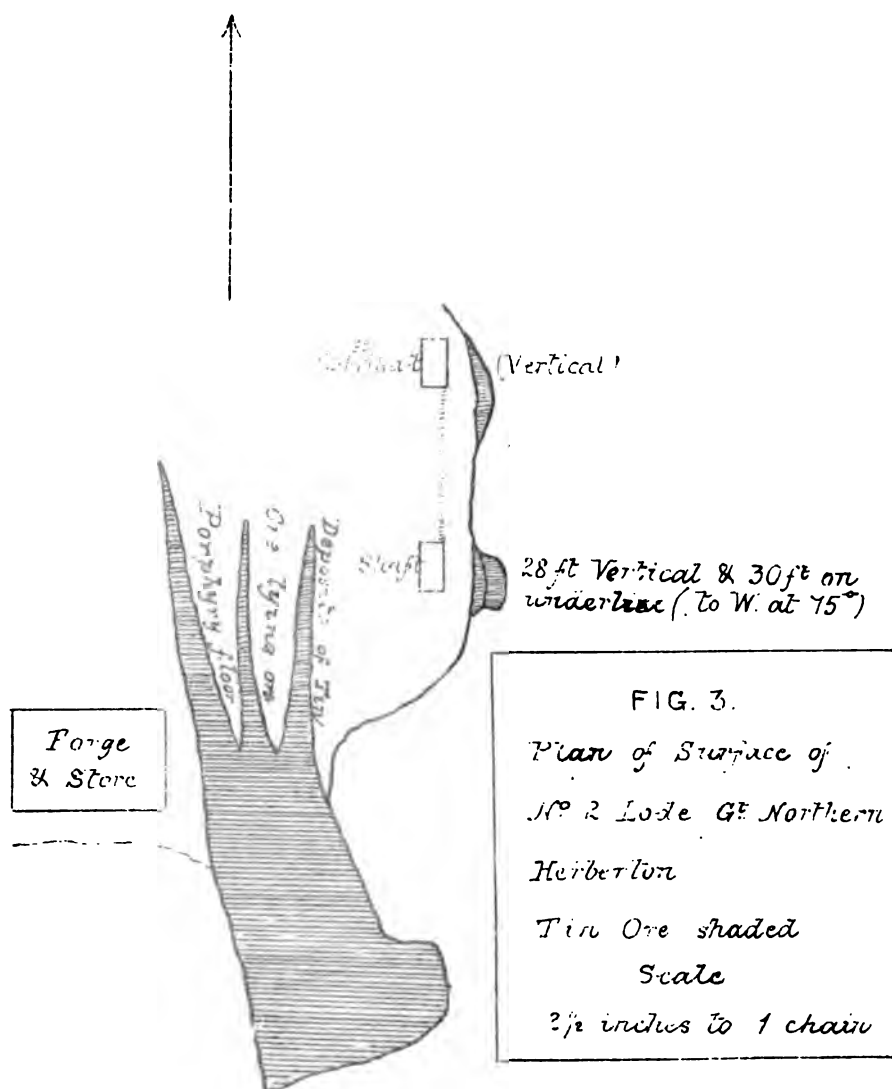
*Price 1s.]*

By Authority: J. C. BEAL, Government Printer, William street, Brisbane.

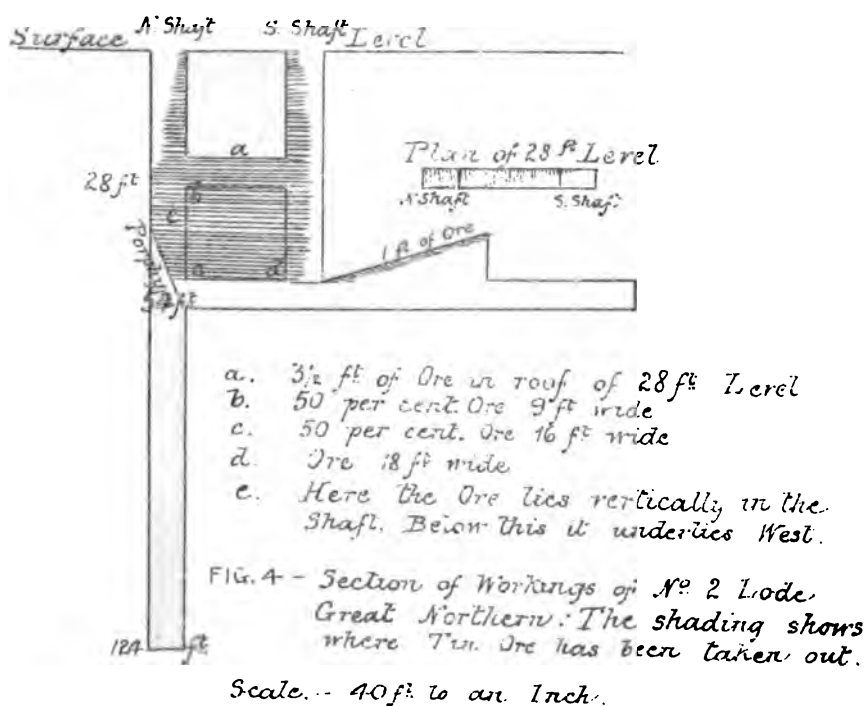


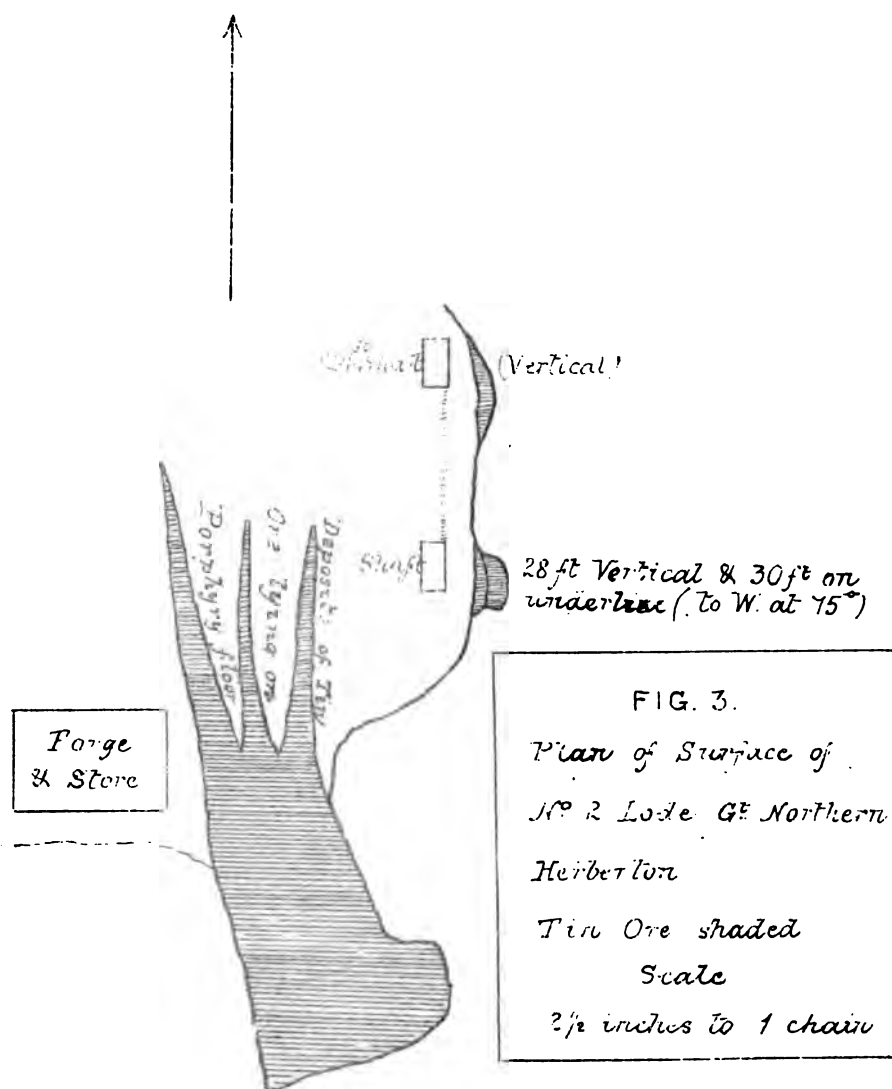
Mem. - The rock within the above lines has been levelled for convenience of working and paddocking.



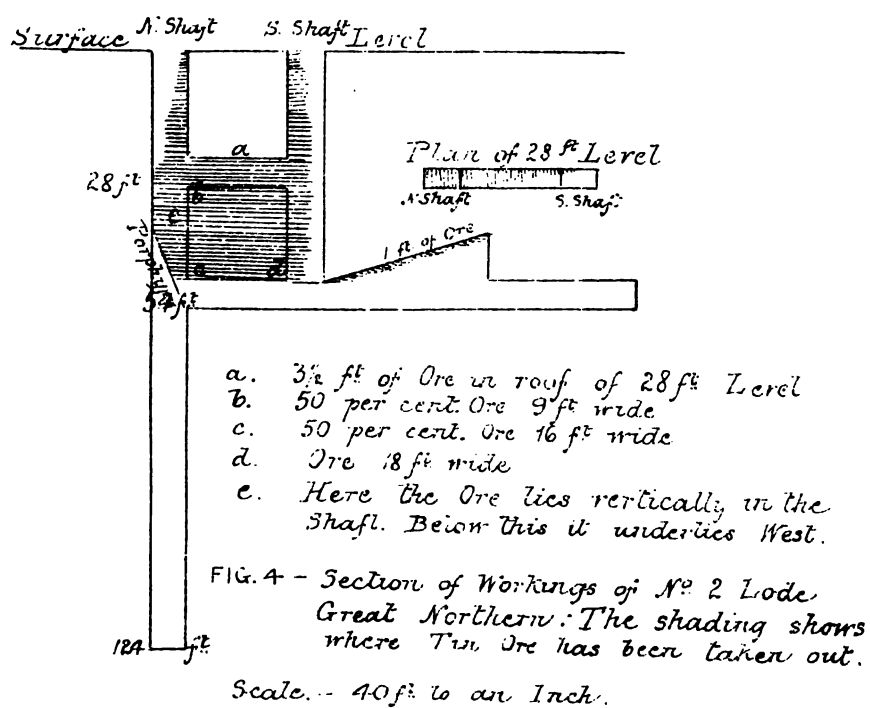


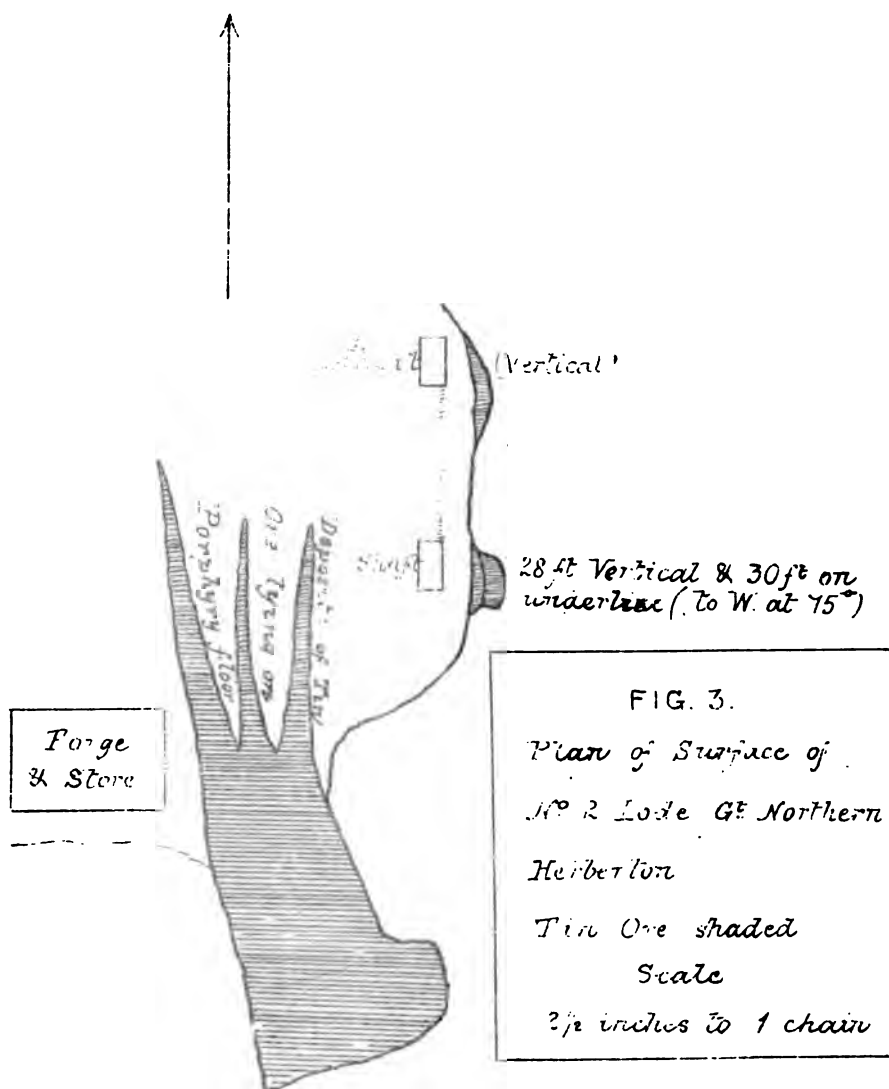
Mem. - The rock within the above lines has been levelled for convenience of working and powdering.



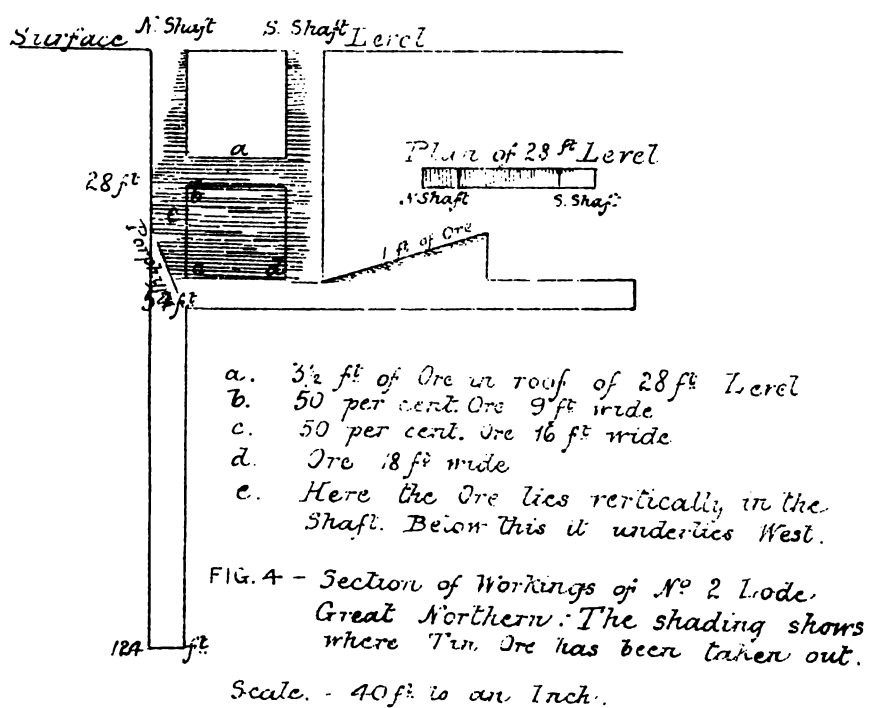


*Mem.* - The rock within the above lines has been levelled for convenience of working and paddocking.





*Mem.* - The rock within the above lines has been levelled for convenience of working and production.



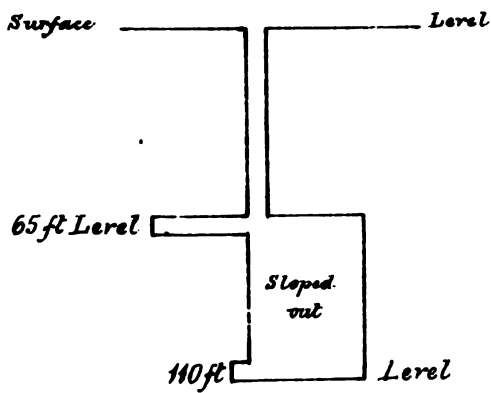


FIG. 7. - Section of Workings  
Black King Mine.  
Scale 60 ft. to 1 Inch.

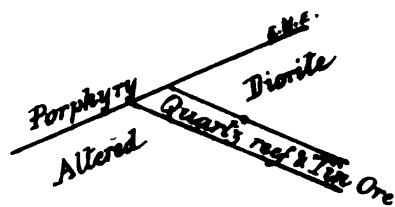


FIG. 8.

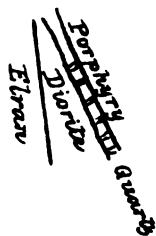


FIG. 9.

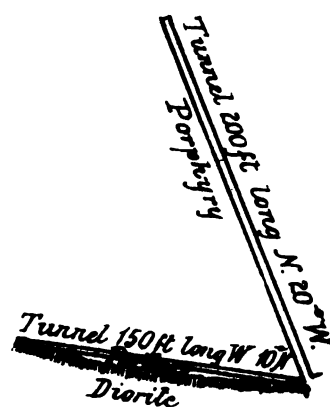


FIG. 10. - Plan (Scale 100 ft. to 1 Inch)  
The Monarch Tunnels.

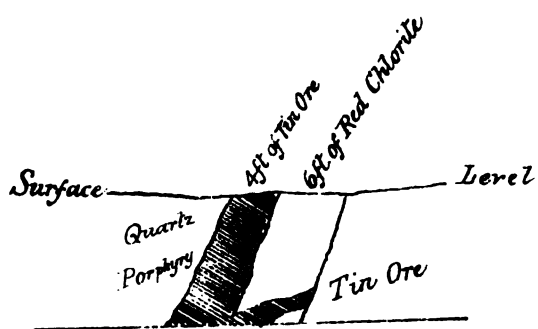


FIG. 11. - Sketch of Surface of  
St. Patrick's Day Claim.

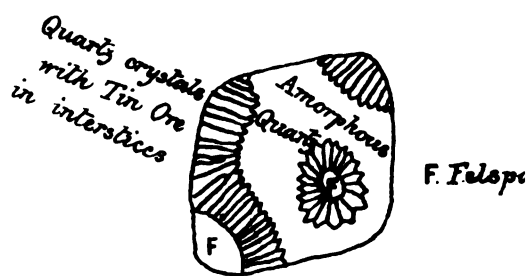


FIG. 12. - Sketch of a Specimen of  
Quartz crystals with Tin Ore in interstices  
from Great Western Claim.



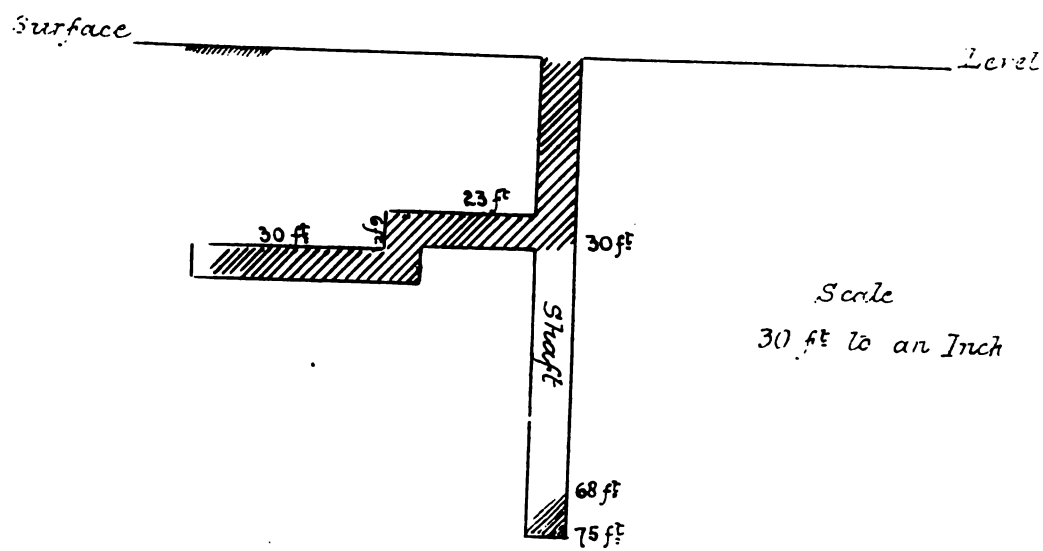


FIG. 14.—Section of Silver streak Workings  
Galena shaded

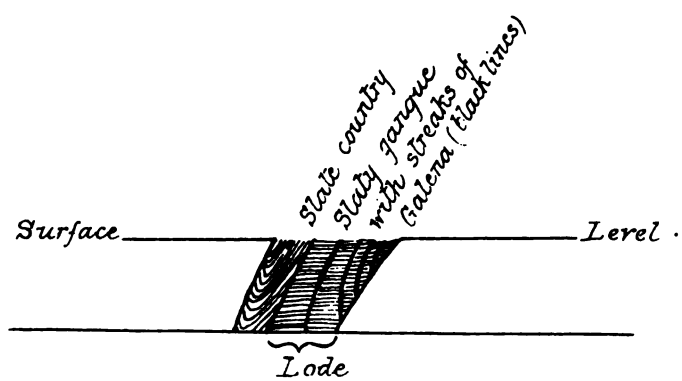


FIG. 15.—Sketch Section in John Bull Claim

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